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MEMORANDUM



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NASA AVIATION SAFETY REPORTING SYSTEM:
THIRD QUARTERLY REPORT

October 15, 1976 - January 14, 1977

*Ames Research Center
Moffett Field, Calif. 94035*

and

*Aviation Safety Reporting System Office
Battelle's Columbus Division
Mountain View, California 94035*

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16. Abstract During the third quarter of operation of the Aviation Safety Reporting System (ASRS), 1429 reports concerning aviation safety were received from pilots, air traffic controllers, and others in the national aviation system. Details of the administration and results of the program are discussed. The design and construction of the ASRS database are briefly presented. Studies of altitude deviations and of potential aircraft conflicts associated with misunderstood clearances have been performed and the results are discussed. Summary data regarding alert bulletins, examples of alert bulletins and responses to them, and a sample of deidentified ASRS reports are provided.					
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Charles E. Billings
Project Manager

NASA Staff:

John K. Lauber, Coinvestigator
William D. Reynard, Attorney Advisor
Hallie M. Funkhouser, Technical Assistant
Nancy C. Mandella, Secretary

Battelle Staff:

Robert A. Rogers, ASRS Office Manager
Rodolfo Vergara, Research Scientist
Christopher Perry, Computer Systems Researcher
Jan Dietrich, Analyst
Donald George, Analyst
Albert Maus, Analyst
William Samuels, Analyst
Ruth Howe, Secretary
Claudette Loporto, Administrative Aide

NASA Headquarters:

E. Gene Lyman, Man-Vehicle Technology Division
Ava J. Walkins-Bull, Man-Vehicle Technology Division

FAA Headquarters:

Larry Youngren, Office of Aviation Safety

NASA AVIATION SAFETY REPORTING SYSTEM: THIRD QUARTERLY REPORT

OCTOBER 15, 1976 – JANUARY 14, 1977

Ames Research Center

and

Aviation Safety Reporting System Office*

SUMMARY

During the third quarter of operation of the Aviation Safety Reporting System (ASRS), 1429 reports concerning aviation safety were received from pilots, air-traffic controllers, and others in the national aviation system. Details of the administration and results of the program are discussed. The design and construction of the ASRS database are briefly presented. Studies of altitude deviations and of potential aircraft conflicts associated with misunderstood clearances have been performed and the results are discussed. Summary data regarding alert bulletins, examples of alert bulletins and responses to them, and a sample of deidentified ASRS reports are provided.

INTRODUCTION

This is the third in a series of reports describing the activities and findings of the NASA Aviation Safety Reporting System (ASRS).¹ It covers the period from October 15, 1976 through January 14, 1977, the System's third quarter of operation under a Memorandum of Agreement signed on August 15, 1975, by the National Aeronautics and Space Administration and the Federal Aviation Administration.

This report presents current data regarding the administration of the ASRS and describes the reports submitted during the third quarter of operations. A brief description of the ASRS database is provided, and examples of studies using the database are presented. Appendix A contains samples of alert bulletins prepared by NASA, with responses from appropriate agencies; appendix B contains samples of deidentified ASRS reports together with brief comments about them.

*Battelle's Columbus Division, Mountain View, California.

¹See also NASA ASRS Quarterly Reports 1 and 2, covering the periods 4-15-76 through 7-14-76 and 7-15-76 through 10-14-76, respectively. Washington, D.C., National Aeronautics and Space Administration reports TM X-3445, September 1976, and TM X-3494, December 1976.

THIRD QUARTER REPORTS: SUBMISSION CHARACTERISTICS

During the third quarter of ASRS operations, 1429 reports were received and processed. This may be compared with 1464 reports during the first quarter and 1497 during the second quarter. With the exception of the predictable fluctuations discussed in previous reports and a pronounced decrease during the Christmas holiday season, incoming report volume has remained virtually constant at slightly over 100 per week.

A total of 2759 second and third quarter reports has been entered in the ASRS database, although some field entries are not yet complete (see section on ASRS information processing). The data that follow are obtained from that source, and from administrative files maintained by NASA.

Callback Actions

TABLE 1.— CONTACTS WITH REPORTERS

Type of contact	Second quarter, percent	Third quarter, percent
No attempt	77	83
Callback completed	18	9
Callback attempted	5	4
Contact by letter	--	4

A third quarter decrease in attempts to contact reporters (table 1) can be attributed in part to the greater experience of the analyst group: many problems that required clarification when encountered for the first time are now better understood. As shown in table 1, letters were written requesting further information in a few cases in which repeated telephone calls had been unsuccessful.

Deidentification of Reports

The implementation of a management control system in November, 1976 has given ASRS management improved ability to track total system performance with regard to deidentification of ASRS reports. During the last 2 months of the quarter, the average total processing time for identified reports was 3.9 days, including time required for screening by NASA and for initial processing by the contractor. As in the previous quarter, this statistic was biased by a small number of reports in which repeated attempts were required to recontact the reporter.

Anonymous reports continued to be an insignificant fraction of the total. The cooperation of the aviation community with this part of the system has been truly outstanding. When recontacted, reporters have invariably been courteous and helpful to ASRS analysts.

Sources of Reports

The proportion of ASRS reports submitted by air traffic controllers has continued to increase. There was a corresponding reduction in reports submitted by aircrew (table 2). During the past 6 months, pilot reports have been distributed as follows: Air carrier, 45 percent, general aviation, 40 percent; military, 12 percent; and Government, other, and unknown, 3 percent.

FAA Inquiries of Incident Identification File

An important part of the concept underlying the FAA's Aviation Safety Reporting Program is the waiver of disciplinary action offered by the FAA in the interest of improving the flow of information that can contribute to improved aviation safety. An Incident Identification File is maintained by NASA. This file contains information sufficient to identify occurrences reported to ASRS, but not the names of reporters. It is erased on the 46th day after the reported date of each occurrence. The FAA may ask NASA whether occurrences have been reported in any case where enforcement action may be pending or contemplated.

TABLE 2.— REPORTERS TO ASRS

Reporter category	Second quarter, percent	Third quarter, percent
Pilot and other aircrew	50	42
Air traffic control personnel	48	54
Others, including passengers	2	4

To date, about one-tenth of these queries have resulted in positive responses (table 3). The proportion of positive responses has remained virtually constant since the implementation of ASRS.

TABLE 3.— INCIDENT IDENTIFICATION FILE INQUIRIES

	4/15/76- 10/14/76	10/15/76- 1/14/77	Total
ASRS report volume	2961	1429	4390
Inquiries received	664	513	1177
Occurrences in file	61	56	117
Positive inquiries, percent of inquiries received	9.2	10.9	9.9
Positive inquiries, percent of report volume	2.0	3.9	2.7

These data may be interpreted in several ways. There is little question that at least some ASRS reports are submitted in order to take advantage of the FAA's limited waiver of disciplinary action. How many are submitted for this reason *alone* is impossible to determine. The large number of reports containing detailed analyses and carefully thought-out recommendations would suggest that most ASRS reporters, regardless of their interest in avoiding disciplinary action, are also motivated by the higher purposes of the program. Reports 20, 24, and 25 of appendix B are good examples, so is report 10a, appendix B, of the second ASRS quarterly report (NASA TM X-3494).

It is known that few queries of the Incident Identification File are instituted by ATC supervisory personnel. If occurrences involving primarily ATC personnel are excluded from consideration, positive inquiries constitute 4.5 percent of report volume. It is believed, on the basis of these data, that the majority of reports submitted to ASRS do not involve investigated violations of Federal Air Regulations and that at most, only 10 percent of enforcement actions based on such violations are hindered or compromised by the existence of the limited waiver of disciplinary action described in FAA Advisory Circular 00-46A, March 31, 1976.

THIRD QUARTER REPORTS: CHARACTERISTICS OF OCCURRENCES

TABLE 4.— TYPES OF OPERATIONS IN OCCURRENCE REPORTS

User category	Number	Percent
Scheduled air carrier	1248	43
Supplemental air carrier	44	2
Air taxi	144	5
Charter operations	72	5
Utility flying	57	
Agricultural operations	17	
Corporate aviation	204	7
Personal business flying	182	6
Pleasure flying	216	8
Training, all types	259	9
Armed forces	343	12
Government, other, and unknown	88	3
	2874	

Types of Operations

The types of operations involved in occurrences reported to ASRS during the past 6 months are summarized in table 4. The database entries in this category are multiple in cases involving two or more aircraft; therefore, the data are not strictly comparable with those presented during previous quarters.

In general, there are few differences between these data and data from previous reporting periods. One exception is an increase in military aircraft reports during the third quarter. As in the past, Air Force aircraft predominate, due to the Hazardous Air Traffic Reports (HATR's) made available by the USAF Directorate of Aerospace Safety.

The reports included in table 4 were further tabulated by reporter — that is, by pilots and by others — to determine whether there were differences between reports submitted by pilots and those submitted by air traffic controllers and others. The results are shown in table 5. In most

TABLE 5.— TYPES OF OPERATIONS IN PILOT REPORTS AND IN OTHER REPORTS

User category	Percent in reports submitted by pilots	Percent in reports submitted by others
Scheduled air carrier	43.4	43.4
Supplemental air carrier	1.4	1.6
Air taxi	4.5	5.4
Charter, utility, agriculture	5.0	5.1
Corporate aviation	6.7	7.4
Personal business flying	8.7	4.4
Pleasure flying	9.8	5.7
Training	9.9	8.3
Armed forces	7.7	15.3
Government, other, and unknown	2.9	3.2

respects, the percentages are very similar. The data indicate, however, that reports involving personal business flying, pleasure flying, and training are more likely to come from pilots than from controllers. Reports involving military aviation are significantly more likely to come from controllers than pilots (excluding HATR's).

Flight Plans

As in the previous quarter, the vast majority of ASRS reports concerned aircraft on flight plans. The number of reports involving IFR operations accounted for more than three-fourths of the 940 reports in which this information was supplied (table 6). It appears that the ASRS is not effectively reaching those general aviation pilots whose operations are not generally within the ATC system. Table 6 includes only those reports in which a specific flight plan type was indicated. Reports of occurrences and situations applicable across flight plan types are excluded.

Airspace

Airspace jurisdiction listings from the database are shown in table 7 for second and third quarter data. Comparable tabulations for the two quarters are not available; this classification has been revised to eliminate areas of possible confusion in the data. The tabulation in table 7 covers 2471 report entries.

Air Traffic Control

The type of air traffic control being exercised at the time of reported occurrences is shown in table 8. As in the previous tabulation, the data combine second and third quarter reports, and cover 2724 entries.

TABLE 6.— FLIGHT PLANS FILED

Type of flight plan	Second quarter, percent	Third quarter, percent
Instrument flight rules (IFR)	65	78
Visual flight rules (VFR)	15	19
DVFR or SVFR	1	0
No flight plan	19	3

TABLE 7.— FAA AIRSPACE JURISDICTION DURING REPORTED OCCURRENCES

Jurisdiction	Number	Percent of entries
On airport	17	1
Airport traffic area or airport control zone	778	34
Terminal airspace: TCA	353	16
TRSA	15	
Other	7	
On airways	466	20
Positive control airspace	333	14
Military operations area	18	1
Oceanic control area	12	
Other controlled airspace	109	5
Uncontrolled airspace	184	8
Unknown	19	1

Phase of Flight

The phase of flight during which occurrences were noted is shown in table 9. As noted in previous reports, multiple entries in this field are common. The architecture of the database requires

TABLE 8.— AIR TRAFFIC CONTROL DURING OCCURRENCES REPORTED TO ASRS

Controlling or monitoring facility	Number	Percent of entries
Tower (ground control)	91	3
Tower (local control)	596	22
Approach control	781	29
Departure control	284	10
Enroute control (ARTCC)	700	26
None	53	2
Other (FSS, AAS, etc.)	219	8

TABLE 9.— PHASE OF FLIGHT

Report applicable to	Number	Percent of entries
Preflight	30	1
Taxi	164	5
Takeoff	323	9
Climb	607	17
Cruise	783	22
Descent	388	11
Holding	46	1
Traffic pattern	145	4
Approach	723	20
Landing	286	8
Missed approach	84	2
Miscellaneous entries	51	1

that all applicable phrases be indicated; thus the data shown here are not comparable with the data shown earlier, which utilized the term “applicable to various flight phases.” The data in table 9 are from the last two quarters and include 3630 entries (multiple entries were found in over 30 percent of the reports).

Aircraft Types

The types of aircraft involved in occurrences reported to ASRS are shown in table 10; 2578 aircraft were identified in the reports.

TABLE 10.— AIRCRAFT TYPES IN ASRS REPORTS

Type of aircraft	Number	Percent of entries
“Trainer,” all types	52	50
Light aircraft, < 12,500 lb	999	
Light transport, < 12,500 lb	227	
Medium transport, 12,500-100,000 lb	302	41
Heavy transport, 100,000-300,000 lb	606	
Wide-body transport, > 300,000 lb	155	
Military (fighter or bomber) ^a	161	6
Miscellaneous entries	76	3

^aMilitary transport and utility aircraft are classified with civil aircraft of the same category.

Weather Factors

Weather was cited as a pertinent factor in 787 of 2117 reports containing specific information in the appropriate data field. The factors most commonly listed are shown in table 11, which combines second and third quarter data.

TABLE 11.— WEATHER FACTORS IN ASRS REPORTS

Weather factor	Number	Percent of entries
Restricted visibility	415	20
Precipitation	118	6
Thunderstorm	73	3
Turbulence	45	2
Crosswind	40	2
Haze, fog	30	1
Ice	13	1
Other	53	2
Weather not a factor	1330	63

ASRS INFORMATION PROCESSING

Introduction

The ASRS milestone schedule contained in the ASRS second quarter report indicated that the third quarter would be largely devoted to implementation of the ASRS database. Despite the formidable problems posed by the complex architecture of the database and associated programming problems, that task was accomplished. In order to acquaint readers of these reports with the major analytic tool of this research, a preliminary description of the contents of the ASRS database is provided here. Intensive examination of the database is now under way; needed modifications will be made during the next several months and then a more comprehensive thesaurus and description will be published.

Overview

One of the principal objectives of the ASRS is the collection, storage, retrieval, and effective manipulation of a massive quantity of aviation safety information. The designers of the ASRS information management system have approached this problem by paying strict attention to the question, "What do we believe the eventual users of this system must be able to do with it?" When a user of the database asks a question related to aviation safety, the degree of satisfaction he will realize is related not only to the power of the computer, but also to how effectively the database is designed to help him gain access to data that bear on his area of concern.

In order to be sure that the language he uses will be understood by the computer, the vocabulary, information classification, and indexing of ASRS reports have been approached with considerable care. This description of the ASRS database is provided for those whose concerns include the structure and manipulation of information. The reader whose primary interest is in the content of the database may wish to go to the following sections of the report, in which the first studies carried out with the aid of the computerized information are described.

The contents of ASRS reports are entered in the BASIS (Battelle's Automated Search Information System) database in two forms. First, each report exists as a unique, complete entry in a master document file. Second, a series of indexed references to the master file is stored in an inverted index file for later retrieval and processing.

A field is a location within a document for a specific item of information. If the information within a field can have only a finite number of representations, the field is said to be *fixed*. For example, a field labeled "flight plan" can have only the following entries: "IFR," "VFR," "SVFR," "DVFR," or "none." A great deal of information can be stored in fixed fields. If desired, it is possible to generate indices for any specific values of each fixed field.

In order to facilitate efficient retrieval, a substantial proportion of the data in ASRS reports is indexed by fixed-field representations. A single document or a family of documents can be accurately described and retrieved by careful design of the fixed fields in the source documents.

However carefully the contents of ASRS reports are classified and indexed, there remains the likelihood that a future user will wish to inquire about some facet of the data not considered by the system's designers. Accordingly, BASIS can also generate index terms directly from the textual portions of reports by one or both of two methods: manual selection of new keywords from ASRS report narratives, or automatic indexing, in which the computer scans the entire body of narratives and indexes all but trivial words. Thus, if the user can specify words that describe and delimit his area of interest, and if those words have been used in context by a reporter to ASRS (or by an analyst in an appended analysis), all reports containing those words can be retrieved and new indices created.

Of the two methods of generating new indices, the first requires more time and effort by the user, but the keywords chosen are more likely to point to the exact content of the desired reports. Automatic indexing requires less intervention by the user, but it is much more likely to select and index unimportant words. Automatic indexing of a large database also consumes an enormous amount of computer time and disk file space and results in the creation of a great number of irrelevant indices.

The compromise chosen for the ASRS database has been extensive use of fixed field information, coupled with the judicious use of keywords from the texts of ASRS reports, to which has been added a series of descriptive words or phrases chosen by ASRS analysts. These segments of the database are considered in the following sections.

File Structure

Each ASRS report in the database contains four interrelated sections of data, each of which is described briefly here. Two sections utilize fully indexed fixed-field format; two contain partially indexed free text.

Administrative data— This section contains an accession number, the year and month of accession, a NASA problem code (cf. NASA TM X-3494), the type of reporter, cross-references to other ASRS reports of the same occurrence if any are available, and information on the disposition

of the report within ASRS. Certain other administrative information may be incorporated if pertinent. The section is in fixed-field format and most entries are indexed.

Technical data— This section describes the participants in the occurrence and lists pertinent attributes of each one. A class of potential hazard is also described. For simplicity, participants have been arbitrarily divided into five classes: aircraft, ground facilities, persons, environments, and software. Mandatory entries are described here, but the programming is designed to accommodate additional entries whenever desirable.

Potential hazard descriptors at this time provide data only on potential conflicts among aircraft. Miss distance estimates and information on evasive action are included.

Aircraft descriptors include aircraft type, as shown in table 10, airframe characteristics, number of engines, operator class and mission (as in table 4), aircraft subsystems, mission phase (phase of flight), airspace, flight plan, and altitude.

Ground facility descriptors include geographic data, type of facility, and a number of optional fields used for other relevant information (such as subsystem data, runway heading, or designator).

Person descriptors include the function of the reporter, his qualifications or ratings if relevant, flight time for aircrew, trainee status if known, and location of persons if not obvious from the context of the report.

Environmental descriptors include weather factors, flight conditions, and light conditions. Optional fields provide space for weather remarks, terrain features and other environmental factors such as noise, heat, and toxic atmospheres.

Software association descriptors allow the analyst to specify ATC or other communicating or information-providing sources and the medium by which messages are transmitted.

Diagnostic data— This section, in abbreviated free-text format, contains subjective judgments by ASRS analysts. It is therefore separate from the remainder of the report. It contains three fields, each of which is quite narrowly defined. In this section, the ASRS analyst attempts to describe in categorical keywords what happened and, by using brief descriptors, to provide his judgment as to enabling and associated factors.

It should be emphasized that these factors, where present, are *not* statements of “probable cause” as defined by the National Transportation Safety Board. ASRS data, lacking investigation and verification of the information provided by reporters, cannot legitimately be used to establish or imply causation. The most that can be done is to make certain statements about factors that were known or believed to be present and pertinent to the occurrence being described.

The definitions² used by ASRS for the contents of these two diagnostic fields are:

Enabling Factor: An element that is present in the history of an occurrence and without which the occurrence probably would not have happened.

² Barnhart, W., et al. A Method for the Study of Human Factors in Aircraft Operations. Moffett Field, California. NASA TM X-62,472, September 1975.

Associated Factor: An element that is present in the history of an occurrence and is pertinent to the occurrence under study, but which does not fulfill the requirements of an enabling factor.

Though the three fields in this section are entered in free-text format, they are automatically indexed by the BASIS system because of their potential usefulness as search and analytic tools. To provide the reader with an appreciation of the types of descriptors used in these fields, tables 12 and 13 list certain enabling factors, associated factors, and keywords that have appeared frequently in the first 2300 reports entered in the database.

**TABLE 12.— ENABLING AND ASSOCIATED FACTORS CITED
FREQUENTLY IN THE ASRS DATABASE
(Preliminary list as of February 1, 1977)**

Enabling factors	Associated factors
Airspace configuration	Climbing traffic
Altitude heading rules	Controller vigilance
Controller perception	Crossing traffic
Intrafacility coordination	Descending traffic
Message confirmation procedure	Interfacility coordination
Pilot discretion	Mixed arrival/departure traffic
Pilot perception	Mixed IFR/VFR traffic
Pilot vigilance	Opposite direction traffic
	Pilot vigilance
	Radar traffic information service
	Radar vectoring
	Standard instrument approach
	Traffic volume
	Training in progress

**TABLE 13.— KEYWORDS CITED FREQUENTLY IN THE ASRS DATABASE
(Preliminary list as of February 1, 1977)**

Aircraft damaged	Late handoff	Pilot deviation
Aircraft deviation	Less than standard	Potential conflict
Altitude overshoot	separation	System error
Deviation from clearance	Merged targets	Uncoordinated penetration
Equipment outage	Missed approach	of airspace
Error, admitted	Mixed military/civil	Unknown VFR aircraft
False radar display	traffic	in area
Go around	Mixed performance	Visual aid deficiency
	traffic	

Narrative data— The fourth section of each report contains narrative data. It is in free-text format and is not indexed. This section contains five fields, several of which are optional.

The first field contains a short (one- or two-sentence) synopsis of the occurrence, prepared by ASRS analysts. The second field contains the reporter's narrative of the occurrence. Editing is usually minimal. The third field contains comments prepared by the analyst if necessary after a callback has been made to the reporter. The fourth field contains recommendations by the reporter if any were made. The fifth field, also optional, may contain comments by the analyst.

Comment

It must be noted at this point that the development of an automated information management system of this degree of complexity, and its further development into a useful and robust tool, is without question the most challenging of the tasks undertaken to date in the course of this research. And although it is the policy of those working with ASRS to share its findings and techniques with the community it serves — hence this initial description of the database — much more remains to be done before this tool begins to take final form. Until effective vocabulary control is implemented, until a comprehensive thesaurus is prepared, and until studies of the database for internal consistency are conducted, the reader must not assume that the terms shown in tables 12 and 13 were used by ASRS analysts in the way that the reader would have used them, or even that they were always used consistently. Where possible, of course, conventional aviation terminology has been employed. Implementation of the ASRS database was pursued as a matter of highest priority during the third quarter of ASRS operations in order to provide at least the rudiments of a tool for further research. The tool, however, must now undergo much further refinement, and it is highly probable that it will be modified as more experience is gained during analytic studies.

STUDIES OF THE ASRS DATABASE

The following two sections describe the first two analytic studies carried out using the resources of the ASRS database. They are presented here to suggest the uses to which this analytic tool may be put. The first study, a compilation of altitude deviations, exemplifies an attempt to discern some of the reasons for this rather common event. The second study of misunderstood communications proceeds from the first, in which it was found that misunderstood clearances were one of the factors associated with altitude deviations.

The primary purpose of the ASRS is not to assess blame for errors in the aviation system, but rather to aid in understanding some of the reasons for such mistakes. These two studies represent a first attempt to inquire systematically into the system and human factors that may be associated with human errors in aviation. They are by no means definitive, but it is hoped that they will provoke interest in the use of the ASRS as a problem-solving tool in the interests of aviation safety.

FACTORS ASSOCIATED WITH ALTITUDE OVERSHOOTS, EXCURSIONS AND UNDERSHOOTS

Introduction

A preliminary examination of keywords in the ASRS database indicated that deviations from assigned altitude were among the most common classes of events in the substantial group of deviations from ATC clearances. Because of the potential impact of such deviations on system safety, this group of events was selected for further study.

Definitions

An *altitude overshoot* is an occurrence in which an aircraft either climbs above, or descends below, an altitude to which it has been cleared.

An *altitude excursion* is a deviation of greater than 300 ft above or below an altitude at which an aircraft has been cleared and which it was maintaining prior to the excursion.

An *altitude undershoot* exists when an aircraft terminates a climb at an altitude below that to which it has been cleared, or terminates a descent at an altitude above that to which it has been cleared.

Altitude deviation is a generic term incorporating all of the above.

Approach

As of January 15, 1977, the ASRS database contained 61 reports coded as containing altitude overshoots (AO), excursions (AE), undershoots (AU), or deviations (AD). Manual records maintained by ASRS analysts identified 29 additional reports which the analysts believed might be pertinent to this study. The 80 records so identified were screened, to determine which of them met the study criteria, by reevaluating either the synopses or portions of the free text. The results of this reevaluation are given in table 14. The final sample of unique events was distributed as shown in table 15.

Results

Of the aircraft involved in these occurrences, over half were air carriers and one-fifth were military — either single or formation flights (table 16).

Potential conflicts between aircraft were reported in 23 (35 percent) of these occurrences. Near midair collisions were reported in 7 cases; less than standard separation was noted in 16 reports.

TABLE 14.— DATA CONSIDERED FOR ALTITUDE
DEVIATION STUDY

	Screening of candidate reports	
	Identified as other than AO,AE,AU	Identified as AO,AE,AU
Reports coded in computer as containing AO,AE,AU,AD	1	60
Possibly pertinent but not coded as AO,AE,AU,AD	18	<u>11</u>
Reports that met study criteria		71
Duplicate reports of single occurrences		<u>6</u>
Unique occurrences		65

TABLE 15.— ALTITUDE DEVIATIONS

Type of event	Number	Percent
Altitude overshoots	54	83
Altitude excursions	9	14
Altitude undershoots	2	3

TABLE 16.— AIRCRAFT INVOLVED IN
ALTITUDE DEVIATIONS

Type of operation	Number	Percent
Air carrier	38	58
General aviation	8	12
Military	13	20
Unknown	6	9

The reports were then studied in an effort to determine what factors were involved in those occurrences. In each case, an attempt was made to select one primary enabling factor and any secondary factors that were pertinent. The results are summarized in table 17.

Discussion

The type of occurrence under consideration here involves — virtually by definition — human error. The errors involved in these events may occur in the cockpit, on the ground, or in both places. It is hardly surprising, therefore, that about three-fourths of the enabling factors (33 of 46) involve human factors. It is not the purpose of this study to place blame, however, but rather to attempt to illuminate those factors, whether internal or external to the person involved, that make an error on his part more likely, or make it less likely that the system will compensate for and recover from an error. This study provides some helpful insights into both types of factors.

It is conceded that this classification scheme is at once arbitrary and to some extent subjective. Further, except in cases where multiple reports were available, it rests entirely upon unverified information supplied by the reporter. Its sole purpose is to assist in a systematic exploration of why such occurrences as these exist despite all of the redundancy and safeguards designed into the national aviation system.

TABLE 17.— ALTITUDE DEVIATIONS: ENABLING AND ASSOCIATED FACTORS

Occurrences in data bank	65	
Insufficient data to permit analysis of factors ^a	<u>19</u>	
Reports analyzed in detail	46	
Factor category ^b	Enabling factor	Associated factor
Man		
Cognition, decision-making	1	4
Monitoring behavior	4	4
Subsystem operation	5	1
Flight control	1	1
Communications:		
Misunderstood clearance	9	1
Other communication problems	4	1
Distraction, high workload	10	6
Software		
Operating procedures, checklists	0	5
Navigation information, charts	2	0
Similar identifiers or trip numbers	2	0
Hardware		
Altitude alert system design	1	3
Autopilot malfunction	4	0
Other aircraft subsystem problem	1	1
Radar not available or OTS	0	2
Environment		
Turbulence, updrafts	2	0
High cockpit noise levels	0	2
Cockpit/instrument lighting levels	0	2

^aOf these reports, 16 were descriptions of overshoots by controllers who had not been made aware of any reason for the occurrence. Eight involved military aircraft.

^bEnabling and associated factors are classified in accord with the taxonomy described in NASA TM X-62,472, pp. 9 ff.

An examination of table 17 indicates that 10 deviations involved misunderstood clearances. In at least three cases, the misunderstood clearances were read back and acknowledged without correction by ATC. In another 10 reports, distractions (often other traffic) or high cockpit workloads were cited. Eleven cases involved errors in cognition and decision-making, monitoring, system operation, and flight control.

In 12 cases (26 percent), the primary enabling factor cited was related to the airplane, the software, or the environment. System factors were listed as pertinent in 13 other cases. The problem most often cited was an insidious failure of the autopilot altitude capture or altitude hold. In these cases, of course, there was an associated failure in human monitoring; in one case the absence of an altitude alerting system may have been an additional problem for a pilot who was accustomed to flying with such a system.

It is instructive to examine briefly, with the aid of some examples, certain of the human and system factors associated with altitude overshoots, excursions and undershoots.

The problem of misunderstood clearances is a particularly vexing one, especially when there is an error both in the air and on the ground. This latter situation involves a breakdown of the redundancy purposely designed into the system to compensate for possible misunderstandings. In some of these cases, such as the following, both flight crew and controller workload may have been factors:

Airline aircraft flight planned and cleared to 24,000 ft. Center later changed clearance to 17,000 ft because of other traffic. At approximately 16,000 ft Center pointed out traffic and issued what pilot thought was clearance to 18,000 ft. Pilot acknowledged and Center did not correct readback. Factors: (1) I misread his transmission of traffic; (2) He misunderstood my clearance readback or failed to correct it.

Phraseology, either in the clearance or in subsequent communications, can also promote misunderstanding. There is a case in point:

Original clearance was unrestricted to 23,000 ft. Shortly after takeoff an amendment was understood by the crew as "Expedite through 5000 ft." We did that and at 6300 were questioned as to our altitude. We were then informed that the clearance was "Expedite to 5000 ft." No reason for advisory was given.

Crew workload can be very high during climbs and descents in high-performance aircraft, particularly in terminal areas. Several reports indicated vividly the problems that can result:

Flight plan . . . San Jose, Sunol 6 (SID) to Portland, OR . . . Cleared as filed Sunol 6 maintain FL 230. Taxi, takeoff normal. At approximately 500 ft we were advised to contact Departure Control. Contact was made with Bay Departure and we were cleared to "Fly the SID" and were also issued numerous traffic advisories. We observed several aircraft at various altitudes and courses in our field of view. First officer was flying aircraft from right seat and I was acting as copilot from left seat. Standard company, FAA mandated, noise abatement departure profile was flown. At approx. 3000 ft AGL first officer initiated aircraft cleanup and after takeoff checklist. While this was being accomplished we received a Departure Control frequency change. New controller issued clearance "Fly SID altitudes." After acknowledgment second officer and I continued after takeoff checklists while trying to maintain a proper lookout for traffic as there were many uncontrolled aircraft in our area. I then observed that the aircraft was passing through 5500 ft. I took action to return the aircraft to level flight at 5000 per the SID. First officer advised that he understood the SID but was preoccupied with heavy traffic.

(Company) procedures call for altitude alert system to be set on clearance limit altitude which in this case was 23,000 ft. Therefore, no alert was sounded passing 5000 ft.

Airline aircraft cleared by Denver Departure to climb to 8000. Passing through 6500 Departure advised of VFR traffic 3 miles at 12 o'clock. Crew sighted traffic in their flight path at approximately 7000 ft. At same time, crew was distracted by extremely loud aircraft transmitter that drowned out Departure Control. In the confusion, our aircraft climbed to 8500 ft before crew noticed altitude excursion and descended to 8000. Our aircraft was cleared through the other airplane's altitude, even though VFR; the situation was close.

Flight (airline aircraft, two-man crew) departed runway 8R to maintain 10,000 ft. Captain left ATC frequency to make company contact in accordance with standard operating procedures. Purpose: to relay departure times to station. While captain was preoccupied the first officer was required to handle radio contacts with ATC. In doing so he allowed the aircraft to climb out of our assigned altitude. We were immediately assigned another, higher altitude . . . Factors: Requiring company radio contacts of doubtful importance. Making these contacts too quickly after takeoff in heavy traffic areas. This is in part due to pressure from station personnel. First officer in this case was new on type and had not flown it for about 6 weeks. He was also using a hand microphone . . .

The high climb and descent rates of jet aircraft, together with the distractions commonly encountered in normal operations, were often factors in these occurrences:

Our aircraft was cleared to descent to 12,000 ft, to reach 12,000 25 miles east of Key Biscayne VOR. While descending through 13,500 Center advised we were following an aircraft at 11,000 ft in our 9 o'clock position. Efforts to see the other aircraft initially were negative, then we picked him up 4-5 miles away at our 9:30 position. As I started to report that I had the traffic I noticed we were passing through 12,000 with a fairly high sink rate. Because I had a seriously ill heart patient aboard and because it was VFR and I had our traffic I allowed the aircraft to scoop out at about 11,500 rather than pull excessive G's. I went ahead with my sighting report and added that I had busted my altitude but was returning to 12,000 ft from 11,500. The controller asked me to confirm that my clearance limit was 12,000. I replied in the affirmative; that was the reason for my reporting my descent below it.

Airline flight was cleared from flight level 240 to 16,000 ft. Shortly thereafter the crew piloted the aircraft to 14,000 ft. The problem was discovered by the pilot in command at 14,700 ft. He immediately stated to Center that we were leveling at 14,000 and requested further instructions. There were several contributing factors . . . the aircraft had just come through a clouded area where light icing conditions existed. Airspeed was 250 knots and rate of descent 1000 ft/min while in the clouds. We broke out in the clear at approx. FL 200 and immediately lowered the nose and accelerated to about 370 knots. Our rate of descent increased to 3000-4000 ft/min . . . to make an expected crossing restriction of 9000 ft at the 25-mile DME fix . . . the expected clearance is a standard one usually received, however, we had only received a clearance to 16,000 . . . as we broke out in the

clear we secured the engine anti-ice. The number 2 anti-ice light did not extinguish and the crew began to troubleshoot the light. Furthermore, at 370 knots in this aircraft the cockpit noise level is very high; we did not hear the altitude warning bell. The warning lights are also difficult to see in the daylight. Also, the pilot flying was cycling the anti-ice switches because of their location. The pilot not flying did not make the required altitude callout "1000 ft above leveloff."

The principal reason the incident occurred is because the flight crew became preoccupied with an engine anti-ice malfunction. This, coupled with a high rate of descent and high cockpit noise level. . . .

Recommendations: (1) When an abnormal situation arises one pilot should be assigned to fly the airplane; (2) Cockpit noise levels should be reduced. I have measured levels . . . at 96 decibels . . . below FL 180 the noise level is so high you can hardly hear anything generated in the cockpit, i.e., warning bells, etc.; (3) The aural altitude warning feature of the altitude alert system should be piped into crew headsets . . .; (4) The altitude alert light should have its cover changed or the location changed to make it easier to see; and (5) Reemphasize callouts by crew member not flying.

The present design of the altitude alert system, which provides an identical aural warning signal when approaching and when departing a preset altitude, was cited as a factor by several reporters. The FAA has proposed to allow this system to be modified so that an aural warning tone will be heard only if the aircraft departs from its assigned altitude. This change should alleviate the altitude overshoot problem somewhat, though the comments of some reporters suggested that they have come to rely on the aural warning approaching altitude as well. Those who complained most bitterly about the duplicate signals were those flying high-density routes with frequent step climbs and descents. Long-haul crews seemed less bothered by the warning approaching altitude. It would appear that pilots will have to exercise considerable caution during the period of the changeover, if the FAA-proposed change is implemented, to avoid problems of the sort described in these reports.

Another area in which pilot aids may be associated with decreased alertness to primary instrument indications is that of flight on autopilot. Malfunction of the "altitude capture" or "altitude hold" mode was reported in four instances. One report was particularly interesting:

This was an Air Force Reserve scheduled flight of over 8 hr duration with four stops . . . about 1530 hours, Houston Center asked us to verify altitude. We were assigned FL 180. Upon cross-checking altimeters, we were at 17,000 ft and descending at about 150 ft/min. The autopilot had been engaged since leveloff and the altitude hold was supposed to be still engaged. Autopilot was disconnected and immediate climb started . . . without verifying that the altitude hold was engaged. However, I distinctly remember engaging altitude hold following autopilot engagement. There is no altitude warning system in these airplanes. . . .

After several hours of flying with the autopilot performing perfectly there is a tendency to omit altitude from your scan unless something abnormal happens . . . I also fly for an air carrier and have discussed the need for an altitude alerting system like those we have in the airlines with . . . Air Force personnel . . .

No estimate of the frequency of altitude deviations can be inferred from these data, since the Aviation Safety Reporting System is a voluntary one. It is significant, however, that system problems as well as human factors were cited as enabling or associated factors in 25 of 46 occurrences (54 percent). While this in no way detracts from the importance of human reliability in the prevention of such occurrences as these, it does emphasize that man's role in the aviation system cannot be considered in isolation. In 12 of these occurrences, a system problem was felt to be the primary enabling factor.

Summary

Forty-six examples of altitude deviations by aircraft on IFR flight plans were analyzed. One-quarter involved human error in the operation of the aircraft or its subsystems, one-quarter involved misunderstood clearances, nearly one-quarter involved distraction or high cockpit workloads. In the remainder (26 percent), system problems were thought to be the primary enabling factor.

MISUNDERSTANDING OF COMMUNICATIONS BETWEEN PILOTS AND CONTROLLERS

Introduction

One of the frequent information transfer problems cited in ASRS reports is that of misunderstanding of radio communications between pilots and ATC personnel or others on the ground. In a study of factors associated with altitude deviations (see previous section) such misunderstandings were found in 22 percent of the occurrences studied. The potential threat associated with such misunderstandings is high. For these reasons, a study of misunderstood communications was undertaken.

Definitions

Communication is, by definition, the exchange of information. This report is concerned specifically with verbal communications: the exchange of ATC clearances, instructions, traffic information, advisories, pilot reports, and the like. Safety in the aviation system demands that such communications be accomplished with a high degree of accuracy and mutual understanding.

Approach

A search of the ASRS database was performed for reports in which "message confirmation procedures" were cited as an enabling or associated factor. The search revealed 143 such reports. A further search revealed that 40 of these reports were also cited as involving a "potential conflict."³

³See NASA TM X-3494, p. 11. Potential conflict is defined as any perceived problem relating to risk of airborne collision, from "less than standard separation" to "near midair collision, too close for evasive action."

Results

The 40 reports coded as involving both a potential conflict and a message confirmation procedure were examined further. A check of cross-references indicated that the reports described 38 unique events. Message confirmation procedures were cited as an enabling factor in 31 and as an associated factor in 7. Other enabling and associated factors cited in the 38 occurrences are summarized in table 18.

TABLE 18.— POTENTIAL CONFLICTS INVOLVING
MISUNDERSTANDINGS: ENABLING AND
ASSOCIATED FACTORS

Factor category	Enabling factor	Associated factor
Message confirmation procedure	31	7
Man		
Perception (cognition)	14	1
Decision-making	6	8
Monitoring behavior	6	2
Subsystem operation	3	
Communications: coordination	2	
phraseology	1	3
System and software		
System configuration	10	11
System functions		7
System procedures		9
Similar numbers and identifiers	2	1
Hardware		
Aircraft radios intermittent	1	
Radar and computers		3
Facility design		1
Environment		
Proximity of two airports	1	
Weather in terminal area		1
Obstructions to vision		2
Frequency congestion		1

Examination of the system and software factors associated with these occurrences indicated that the 21 system configuration factors included those shown in table 19.

System functions involved seven entries; three were related to training in progress, three to shift changes and one to briefing of relief personnel. Procedures (nine entries) included five references to radar traffic information service.

TABLE 19.— SYSTEM CONFIGURATION FACTORS

Factor	Number of entries
Multiple runway operations	6
Split control (local) for parallel runways	1
Aircraft under separate ATC jurisdiction	1
Aircraft on separate ATC frequencies	7
Airspace configuration	3
Combined sector operations	3

Discussion

The study of altitude deviations (previous section) examined factors associated with a particular class of event — an outcome. In this study, we have examined an enabling factor found in several cases to be associated with that outcome. Here, we attempt to search for other classes of events associated with the factor of misunderstood verbal communications, as well as looking for other system factors that may be involved.

In order to illustrate what have been termed “system configuration factors” some of the reports examined in this study are reproduced. Multiple, parallel or intersecting runway operations present a potential for conflicts between aircraft, especially if a clearance or instruction is misunderstood:

Aircraft A called Tower and reported ready for takeoff runway 18. I instructed A to taxi into position and hold on runway 18. He was not cleared for takeoff because of aircraft C on short final for runway 23. While this was going on I was told to watch for emergency equipment bringing oxygen to gate 6 for a passenger . . . as aircraft C rolled through midfield aircraft B (same make as A) called the Tower . . . I replied . . . He answered “We’re ready to go runway 36.” I then noticed that aircraft C was past midfield, leaving the way clear for aircraft A, in position on 18. My next transmission was “Aircraft A, runway 18, caution wake turbulence arriving jet, you’re cleared for takeoff.” I received a double reply with aircraft A coming through saying he was rolling. As I cleared A for takeoff I noticed the emergency equipment coming out with the oxygen and having to cross the runway A was using. My attention was momentarily diverted to what the Ground Controller was doing with the emergency equipment because he had cleared the equipment across runway 18 to gate 6. As I instructed the Ground Controller to hold the emergency equipment because A was rolling on runway 18, Aircraft B called the tower and said “We’re rolling runway 36.” With my attention diverted I thought I heard “We’re ready runway 36” and I took no action. Aircraft B took aircraft A’s clearance for takeoff and took off on runway 36 as aircraft A was taking off on runway 18. At midfield I saw aircraft A take evasive action to miss aircraft B.

Aircraft A, IFR to Houston, was cleared into position and hold. We had aircraft B and aircraft C on final. Aircraft A taxied into position and held for awhile. He then started to

roll on runway 12R with aircraft B on short final for 16R. The Tower controller told aircraft A to hold his position and to abort his takeoff but A continued. Aircraft B was then told to go around. He passed over aircraft A at the intersection . . . It seemed that aircraft A was never aware that there were other aircraft in the area . . .

Aircraft in the same airspace under separate ATC jurisdictions or aircraft communicating on separate ATC frequencies are reported fairly frequently. A number of examples appeared in this sample:

At --- I accepted a handoff west of Pacific intersection on aircraft B at 15,000 inbound to San Diego. Departure was working aircraft A handed off to Center climbing to 14,000. When I talked to B, I observed the altitude on A to be 14,900, 1 mile from B, opposite direction. I told B "Traffic 1 mile, head-on, northbound." He said "Yeah, he just went by us." The next sweep aircraft B was at 15,000, aircraft A was at 15,200. The tape at Center showed A requested higher. He was told of traffic 12 o'clock 5 miles at 15,000, expect higher when clear. Aircraft A pilot apparently continued his climb . . .

Controller cleared aircraft A for taxi but to hold short of active runway. Aircraft A crossed active runway after aircraft B had been cleared for takeoff. B advised Tower of A on the runway as he flew over A . . .

We were in the process of decombining the arrival and departure positions. The aircraft involved was an A inbound to Dayton Airport on the 24R localizer and a B inbound to Piqua on a converging course, northwestbound. A was cleared to descend from 4000 to 3000 by the arrival controller; pilot acknowledged by saying "All right." I, working departure position, was controlling B at 6000, requesting lower. I coordinated with arrival for the converging traffic and was told I could descend to 4000. I then cleared B down to 4000. A few minutes later A reported seeing the traffic in front of him. I did not realize A was even on my frequency and advised him that the traffic was at 4000 and to contact approach control on the proper frequency. He said he was also level at 4000 and changed to approach frequency. Both aircraft had already crossed courses.

The pilot of the A aircraft should have read back the clearance to 3000 and stated his call sign. The arrival controller should have made certain the pilot received the clearance by getting the proper acknowledgment.

It should be noted that the A arrival was still on departure frequency when positions decombined. When the arrival controller turned off the departure frequencies and just used arrival frequencies, he was unable to contact A on two attempts to verify his altitude. Therefore, I think when positions are combined all aircraft should be on one frequency, to the extent possible with regard to transmitter capabilities.

Similar aircraft or flight numbers and similar numerical data are a continuous problem in a system that relies heavily on voice communications for transfer of information. The following synopses and extracts illustrate the problem in this context.

One aircraft climbing and one aircraft in level flight passed each other with less than standard separation due to misunderstanding of one pilot who turned to 090° instead of 190° as instructed . . .

We were cleared for a Decatur 3 arrival to Lambert Field with a crossing restriction of 8000 ft 25 miles out. There was a flight in trail behind us. The Center controller started mixing up the numbers and in the confusion both aircraft answered the wrong calls. The numbers of the flights were similar. We were a little high and the controller asked us if we could make the crossing restriction. Aircraft B answered for us. I said we could probably make it . . . I asked for a turn to help us get down and got no answer. We then put out speed brakes and made the crossing restriction. In the garble of the communications we had picked up the approach frequency so we switched over on our own and reported level 8000 ft. This controller evidently expected us . . . This situation is caused by overworked controllers and similar flight numbers.

I was working the High Sector without a tracker. Aircraft A reported in at FL 310 with a rerouting request which I gave him, to maintain FL 310. Aircraft B (similar number) reported in climbing to FL 290, requesting 410. He was restricted to 290 because of A. The sector then began to get busy due to putting A's route change into the computer and another aircraft entering the sector which I had no information on. At about —Z aircraft B asked me what was the altitude of the aircraft that just passed him. I informed him that A was level at 310. When I looked closer I observed A was at 290. When I questioned A he said he had been cleared to FL 290. I called my supervisor . . . after listening to the tapes it appears that during a busy period aircraft A requested permission to deviate east of course. I understood aircraft B and read back "aircraft B, deviation approved, maintain 290." Aircraft A copied that clearance and descended . . .

In these reports, errors in perception on the part of pilots and controllers were the most common of the human factors. Errors in decision-making, based on faulty information (or on faulty perception of correct information) were nearly as common. The practice of omitting parts of clearances was cited in some reports, as in the following comment. (See also ASRS QR-2, p. 52, report 23.)

It appears that "haste makes waste" again. Radio communications, from all parties involved, are deteriorating, and thus the number of "wrong trip" identifications is on the rise. Specifically, the prefixes, company names, are regularly being omitted, and only trip numbers are used. The safety compromise is too great a price to pay (for the time saved) . . . Some crews are refusing to reply to improper calls, thus causing more radio traffic. Some controllers will not use the proper prefix until pressed in this manner. Both ground and flight crews need to work together to adhere to proper usage . . .

Several reports cited in some detail the factors that made it difficult to obtain clarification, among them frequency congestion and high traffic volume. In the majority of these reports, however, no attempt was made to question the clearance given, perhaps because what was heard was often in accord with the expectations of the flight crew.

Airline aircraft A reported the field in sight and while being vectored to the pattern by Approach Control was advised to expect a visual approach to runway 10L and would follow airline aircraft B approaching from the southwest. While the controller was checking his progress strips aircraft A turned toward the airport. Controller noticed the excursion from the vector heading on radar scope and advised A to make a 360° turn to the left. The pilot of aircraft A thought he had been cleared for a visual approach rather than understanding he was to expect a visual approach . . .

The interface between flight and ground personnel in the national aviation system is just as complex as the interfaces between each of them and the machines they control. It is subject to degradation because of problems either in the air or on the ground. Distractions, high workload, or equipment malfunctions in either place can affect not only the local environment, but also the situation of the others involved in the interface.

It is worthy of note that several of the problems cited in these two studies arose because of procedural shortcuts or non-standard phraseology, either on the ground or in the air. It would appear that strict adherence to standard operating procedures would have avoided at least some of these occurrences, but it is also evident from other ASRS reports that frequency congestion in certain high-density areas is such that literal use of standard procedures and phraseology is impossible. Federal Air Regulations do not at present require that clearances be read back, only that they be acknowledged.

Summary

The ASRS database contains 143 reports involving misunderstanding of radio communications. Forty of these reports described potential conflicts between aircraft in flight. Faulty perception was a major human factor in these occurrences, with faulty decisions often resulting from the misperceptions. Certain system configurations were also commonly associated with this class of occurrences.

ASRS ALERT BULLETINS

Cumulative Alert Bulletin statistics are shown in table 20. The number of alert bulletins submitted during the third quarter was 62, virtually the same as that for the second quarter. About 4 percent of all reports resulted in the submission of alert bulletins, although this does not take account of the bulletins generated because of a number of similar or related reports. For a discussion of criteria for submission, see QR-2, page 13.

The disposition of alert bulletins is shown in table 21. The data in table 21 cover only the period through December 31, 1976; appendix A likewise shows only alert bulletins generated during 1976. In the future, all ASRS quarterly reports will cover activity during calendar quarters; the alert bulletin files have been modified to reflect this change.

TABLE 20.— ASRS ALERT BULLETINS: PROBLEMS BY CATEGORIES

Category	1st quarter, percent	2nd quarter, percent	3rd quarter, percent
Hardware			
Navigation	10	7	6
Communication	8	5	8
Aircraft	3	0	2
Other	1	0	2
Software			
Regulations and procedures	18	21	26
Navigation charts	8	12	3
Computer software	4	2	3
AOM/FOM	1	0	2
Liveware			
Communications problems	11	12	3
Management problems	6	5	5
Other	5	3	2
Environment			
Airport problems	16	33	29
Surface hazards	5	0	6
Airborne hazards	4	0	3

TABLE 21.— RESPONSES TO ASRS ALERT BULLETINS

As of December 31, 1976, total bulletins submitted		219
Submitted for information only		3
No response received to date.		<u>17</u> <u>20</u>
Responses received as of March 15, 1977:		199
Content of 199 responses received to March 15, 1977:		
Information insufficient to permit investigation of problem	11	
Information in bulletin incorrect or incomplete	6	
After study, no system problem found; no action required	<u>46</u>	63 (32 percent of total responses)
Alert bulletin information under investigation	18	
Investigation complete; action on the problem not within FAA purview	<u>2</u>	20 (10 percent of total responses)
Action to resolve the problem in progress when bulletin received	27	
Action has been or will be initiated to resolve problem	56	
Action has been taken and is complete	<u>33</u>	<u>116</u> (58 percent of total responses)
Total		199

DISCUSSION

ASRS report volume has now remained relatively constant for 39 weeks. When the ASRS concept was originally presented to the aviation community, it was stated that a major goal during the first year of the program would be to evaluate the utilization of the system by the people of the community. A predicted downtrend in reports after an initial peak has not materialized to date, though the distribution of reports in terms of several major attributes has changed somewhat during the time the system has been in operation.

It is also clear that ASRS has been successful in obtaining large numbers of reports describing human errors in the aviation system. It is precisely this sort of information that has not previously been available because of fears of punishment by those who work within the system. The potential value of having such information is just beginning to be appreciated, but experience to date indicates that it will be substantial.

Thus, while the ASRS concept is by no means proved at this time, it appears on the basis of preliminary data that it may have merit. The cooperation of the many people in the aviation industry who have carried it thus far has been invaluable.

The managers of the ASRS solicit, and will be responsive to, comments and criticisms from readers of these reports. Such comments should be directed to:

Charles E. Billings, M.D., Chief
Aviation Safety Research Office, 239-3
Ames Research Center, NASA
Moffett Field, California 94035

Ames Research Center
National Aeronautics and Space Administration
Moffett Field, California 94035, April 12, 1977

APPENDIX A

EXAMPLES OF ALERT BULLETINS AND RESPONSES

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The first and second ASRS Quarterly Reports contained examples of Alert Bulletins generated on the basis of reports submitted to the ASRS. Another sample is reproduced here, together with responses by the FAA and others in the aviation community. The Bulletins have been categorized to assist in locating those of particular interest to the reader; the classification is shown in the index to this appendix.

AIR NAVIGATION

A variety of topics is covered here, including instrument approach procedures (1, 2), clearances (3, 4), and tolerances (5), departure procedures and phraseology (6), and hazards to enroute navigation (7).

1. Text of AB: Reading PA IFR approach procedures, RY 36: Several controllers report numerous instances of pilot deviations during IFR operations due to complexity of initial approach procedure. Inbound routing is via V-39 and V-162S to Boyer (IAF). Traffic is then routed via V-170, join LRP R-082 to join Reading LOC. Procedure involves 95° right turn, 67° left turn, and another 81° left turn, all while traversing a total distance of less than 10 miles, and usually further complicated by simultaneous descents.

Text of Response: The problem stated above occurs when New York ATC Center traffic above 5000 ft is cleared to Boyer Intersection for hand-off to Reading Approach Control. Air traffic that arrived over Boyer Intersection was required to follow the complex routing as stated above. Inbound traffic on V-39 and V162S proceeding to Reading, PA airport are normally routed below 5000 ft via the published transitions from Lancaster VORTAC and Fleetwood intersection prior to reaching Boyer intersection. The problem has since been relieved by establishing a new transition direct from Boyer Intersection to the Reading NDB/Outer Marker (LOM). An amended procedure with the new transition became effective August 12, 1976.

2. Text of AB: Kansas City, MO, MKC Approach Control (and other locations): Recent pilot report describes three occasions when approach and descent instruction from Kansas City Center and Approach Control have required absolute maximum performance descents. In two cases, crossing restrictions were imposed after descent was initiated. This has also been cited as a problem on descents into DFW. Pilots reporting mention effects on passenger comfort and high crew workload precluding adequate watch for other traffic among problems posed by these clearances.

Text of Response: In order to eliminate or minimize situations where crossing restrictions are issued in the arrival phase of flight, we have dedicated our efforts toward the development of a standardized descent procedure for use throughout the air traffic system. This "Profile Descent" procedure will provide an uninterrupted descent (except where level flight is required for speed adjustment; e.g., 250 knots at 10,000 ft MSL) from cruising altitude/level to interception of a glide slope or to a minimum altitude specified for the initial or intermediate approach segment of a non-precision instrument approach.

Ideally, descent restrictions will be avoided, however, we must recognize that certain situations invariably arise where the controller must issue an unplanned restriction because of conflicting

crossing traffic, emergencies or other control situations which will preclude a perfect profile descent.

This concept of making an approach to the runway without leveling off and without coming out of idle thrust will not only improve the cited descent altitude restriction situation but will also provide an economic benefit to the user. A substantial amount of fuel savings will be realized by using properly designed profile descent procedures.

Implementation of Profile Descent Procedures has already begun at Stapleton International Airport, Denver, Colorado, with Atlanta soon to follow (approximately May 1977). The 15 busiest airports are expected to implement these procedures by December 1977. All other airports that serve high performance aircraft will be operational with these procedures by July 1978.

3. Text of AB: Various locations: ASRS has received one report from a pilot who requested a VOR approach, received it and after landing discovered his request was interpreted as a request for an IFR flight plan, which he had not intended (not instrument rated). Another more general report has been received indicating that approach controllers are often left in doubt as to whether pilots are requesting an actual IFR clearance or merely practice approaches while maintaining VFR. This reporter suggests that current phraseology is not specific enough, and that this area of misunderstanding would be clarified if FAA would "specify the minimum flight plan information which would be considered as constituting the filing of an IFR flight plan. . . . For an airborne aircraft, minimum information would be the explicit statement: 'Request IFR approach clearance to _____.'" Further, pilots should be reminded that if they do not wish an IFR clearance, they must include the word "practice" in their request to ATC.

Text of Response: The ASRS has discovered an interesting ATC problem. An aircraft wanting a practice instrument approach to an airport, in particular to an uncontrolled airport, which requests the approach without stating "practice" will be controlled as an IFR aircraft. An additional problem could arise in that the controller will expect the pilot to cancel his IFR flight plan; however, the pilot will not do so. This may lead to a number of events taking place including search and rescue efforts.

The information in the AIM Part I, page 1-45, Practice Instrument Approaches will be revised to emphasize the use of the term "practice."

Federal Aviation Regulations (FARs), Part 91.83, states the several specific items of information that pilots may be required to provide when filing an IFR or VFR flight plan. It makes provision for filing of other necessary information and for omission of information that is not or will not be required. It is a pilot responsibility to provide information that may be essential to the safe completion of his flight. The information varies and will not permit designation of specific items.

Regarding specific phraseology "Request IFR approach clearance to _____. " ATC clearances are not broken down into IFR clearances or VFR clearances. They are all "ATC clearances." In practice, pilots either request an instrument approach or a specific instrument approach. An instrument approach may be conducted by *either* an instrument rated pilot or practiced by a pilot not instrument rated.

4. Text of AB: Dallas-Fort Worth TCA, TX: Numerous non-airline operators have complained about the apparently common practice by DFW controllers of vectoring turboprop and turbojet aircraft into Dallas under and around the TCA regardless of other circumstances. Aircraft are required to descend to 4000-6000 ft MSL 50 to 60 miles from Dallas, greatly increasing fuel consumption and chances of encountering low speed civil traffic. Similar practices are alleged to govern departures from Love Field. Reporters state that they are invariably on IFR flight plans and that they carry all equipment required to transit TCA. The current practice, however, appears to preclude use of TCA by aircraft enroute to or from Love Field.

Text of Response: Procedures serving satellite airports in the DFW terminal areas do not preclude the movement of such flights through the TCA to and from their destination airport. Daily records of operation substantiate that these procedures are routinely practiced. There are conditions that have affected utilization of such procedures to the optimum, the most paramount of which is traffic. During heavy arrival/departure periods at DFW under certain weather conditions, dispersal of traffic/work load between controllers, both in the en route and terminal sectors, has been necessary, thus requiring traffic separation to be accomplished in the areas of lesser activity, i.e., along the bypass airways or radar vector routes. Refinements are being pursued to establish procedures which will improve service in the area and a test, which began on November 15, 1976, is now in progress which will provide an optimum rate of descent from the aircraft's cruising altitude to the final approach course for turbojet aircraft destined to all of the satellite airports in the DFW terminal area.

5. Text of AB: Executive Airport – Johnson County, Olathe, Kansas: The RNAV Runway 17 approach, as currently structured and charted, is reported to result in aircraft being misaligned west of the approach end of the runway by as much as 0.5 mile from the runway centerline. The reporter, based at the airport, alleges that the problem persists despite notice given to supervisory ATC personnel and a recent FAA check which, although apparently classified as satisfactory, resulted in the flight check aircraft flying “one-half mile or more west of the airport.”

Text of Response: As requested, an investigation was conducted of the RNAV approach to Johnson County, Olathe, Kansas, Runway 17. The Kansas City VORTAC provides radial and distance information to make up the missed approach point which is published as the MKC R187 at 26.4 n. mi.

The last flight inspection of the MKC VORTAC was performed on July 13, 1976, and the alignment of the 187 degree radial at 26.4 n. mi. was found well within flight inspection tolerances.

It must be recognized that a very small error results in increasing displacement as the distance from the facility is extended. For example, 1° of radial displacement at 1 n. mi. is about 106 ft. Extending this to 26.4 n. mi. results in a displacement of 2798 ft or nearly 0.5 mile for only 1.0° of facility error.

Another factor that must be considered is the airborne receiver which is allowed by FAR 91.27 to be in error by as much as 4.0° .

Considering ground facility distance from the MAP and possible airborne receiver error, the misalignment as observed by one user is not believed excessive for this non-precision approach.

The following report discusses a problem with which, it is believed, instrument-rated pilots may not be familiar. There are several airports (how many is not known to ASRS) where runway designation numbers may not coincide with magnetic headings. Tucson is one; Los Angeles International Airport is another. The response states that aircraft departing from a runway are expected to fly the magnetic heading of that runway, but the navigation charts used during takeoff do not include runway heading information, which is ordinarily available only on instrument (ILS) approach charts.

6. Text of AB: Tucson, Arizona; Tucson International Airport: Standard Instrument Departures A) Benson Three, B) Marana Two and C) Tubac One, all call for departures to "maintain runway heading." Because of the renumbering of runways 12L and 12R to 11L and 11R respectively, maintaining the runway number's heading places departures in possible conflict with VFR traffic in the departure corridor between Tucson and Davis-Monthan AFB. Controllers suggest a possible rewording of the above cited SID's to state "... take up a heading of 120 degrees after departure for vectors ..."

Text of Response: A departing IFR aircraft that has been assigned "maintain runway heading" either through a SID or ATC instructions, is expected to fly the actual magnetic heading of that runway, not the runway numbers heading. The actual runway heading of the runways referred to are: Davis-Monthan, 123° and Tucson International, 122°. The runways were numbered at Tucson to eliminate confusion. A somewhat similar situation exists at Los Angeles Airport where runways 25L, 25R, 24L, and 24R are all 248° magnetic.

Aircraft in the VFR corridor are afforded STAGE III service and provided 1.5 miles lateral and/or 500 ft vertical separation from other STAGE III and IFR aircraft in this controlled environment.

7. Text of AB: Mt. Mitchell (North Carolina) – in the vicinity of V35/V53 approximately 8 n. mi. north of Basic intersection/25 n. mi. north of Sugarloaf VORTAC: The location and 9000 ft MEA of V35/V53 are reported to be conducive to the creation of unusually severe turbulence and downdraft problems for all categories of aviation operations on or near the airway in the vicinity east of Mt. Mitchell. Reporters state that because of prevailing wind conditions and velocities (gusts have been recorded at 161 mph), coupled with the topography of the area, the airway should be relocated to a less turbulent area or the MEA raised to at least 10,000 ft MSL, and the hazardous conditions in the area should be noted on applicable VFR and IFR charts.

Text of Response: Action has been initiated by the Southern Region to request AAT-430 to place a notation on charts advising pilots of precipitous terrain and strong downdrafts in the vicinity of Mt. Mitchell.

A NOTAM has been issued raising the MEA on V-35 from 9000 ft to 11,000 ft MSL.

Action has been initiated to realign V-35 further to the east so as to encourage pilots to fly this route at lower altitudes rather than V-35.

AIRPORTS: FACILITIES AND MAINTENANCE

There are limitations on the FAA's ability to effect changes at privately owned airports. Nonetheless, FAA's Airport personnel, both locally and nationally, have been extremely responsive to reports of possible problems at and around airports. A number of examples are cited here. Bulletin 8 comments on a text program. Bulletin 9 involves helicopter operations. Ground traffic patterns are discussed in bulletin 10; bulletins 11-17 describe a variety of hazards on and adjacent to airports. Bulletin 18 illustrates the thoroughness of FAA's response to a specific problem. Photos illustrating the problem were supplied by the reporter and were of considerable help to ASRS in assessing the magnitude of the problem.

8. Text of AB: Idaho Falls Airport, ID: Runway 2-20 markings are yellow rather than white. Air carrier pilots indicate that markings are inferior to white, especially when illuminated by landing lights or in poor visibility. It is understood that runway markings are about to be repainted, again in yellow. Report requests that this instrument runway's markings be redone in white or that visibility minima be raised.

Text of Response: The Northwest Region states the yellow runway markings at Idaho Falls Airport are a special test. It is the consensus of the airport operator and the pilots that these markings are superior to white in all respects except that at night they do not show up quite as well as white, but that the difference is not of sufficient magnitude to outweigh the other advantages. The Northwest Region has initiated action to make yellow markings acceptable for use on airports particularly those in the colder climates.

9. Text of AB: San Jose Airport, CA: Helicopter-fixed wing operations mix has recently resulted in a near-accident due to jet blast on helicopter at liftoff. Reporters request that an official helipad be designated and marked, and that rotary wing operators maintain contact with SJC ground control during ground operations, including air taxi.

Text of Response: The Western Region is exploring the feasibility of designating a helipad on the San Jose Airport. The Airports Division Certification Inspector will discuss this proposal with the sponsor and the tower personnel.

10. Text of AB: Tampa International Airport, Tampa, FL: Several recent reports of aircraft inadvertently taxiing onto runway 36R from the east ramp area (particularly Gate 21) have attributed the mistakes partially to: (1) taxiway lighting and markers being inadequate to properly define the ramp exits, taxiways, and runways; and (2) the need for ATC ground control to issue specific precautionary instructions to aircraft leaving the east ramp area for the taxiway west of and parallel to runway 36R.

Text of Response: According to information received from our Miami Airports District Office, the taxiway lighting, signs, and marking at subject taxi/runway intersection are in accordance with FAA criteria. At present, the taxiway is closed until further study is completed. Our Miami Airports District Office is implementing an immediate study of taxiing ground flow of aircraft to determine

if the subject taxiway should be relocated or if additional taxiways are needed. After this study is completed, we will cooperate to the fullest to take the necessary corrective action.

11. Text of AB: Baltimore, Maryland, Baltimore Airpark: Incorrect wind direction indications for landing aircraft are attributed to the practice of chaining the tetrahedron in a fixed position.

Text of Response: The tetrahedron has not been condoned by the FAA for several years. The Eastern Region, through the Maryland State Aviation Administration, is taking steps to have this tetrahedron removed.

12. Text of AB: Bridgeport, Connecticut, Sikorsky Memorial Airport: AIM-Part II Airport Directory listing for this airport does not reflect the possibility that aircraft landing on runway 29 or departing on runway 11 may encounter severe turbulence, flames, and smoke from garbage dump fires off the east end of that runway. A recent pilot report questions the advisability of using runway 11/29 during those times when the garbage dump is actively burning, even with notice from the tower prior to approach.

Text of Response: The source of the smoke and flames was the Stratford town dump. This dump has been closed as of January 3, 1977.

13. Text of AB: Hartford, CT, Brainard Airport: Pilot report suggests that trees on approach ends of runways 2 and 20 have grown to the point that approaches using VASI now bring aircraft within 75–100 ft of treetops.

Text of Response: Brainard Airport at Hartford, CT, has trees off the end of runway 02 which are 1425 ft from the runway, giving an approach ratio of 14 to 1. However, with a displaced threshold this approach ratio is 21 to 1. Runway 20 has trees 1060 ft from the runway and an approach ratio of 10 to 1. However, a displaced threshold makes this ratio 19 to 1. Since the trees are not on airport property, the New England Region is exploring ways to have the trees topped.

14. Text of AB: Lampasas, TX, Lampasas Airport: Report alleges that rotating beacon operates intermittently, that several runway lights are out, and that obstruction just off end of runway 16 is not always illuminated. Reporter states these conditions have existed for 18 months, despite notification of city by pilots using the field.

Text of Response: The Southwest Region has advised that the runway lights and the rotating beacon have just been reworked and are in operation. The obstruction mentioned in the report is a microwave tower which is 2 miles from the runway and is lighted.

15. Text of AB: El Paso, TX, Sunland Airpark: Report alleges that one side of runway 10-28 is unlighted, making night landings very hazardous. Condition has existed for over 1 month despite complaints to FBO.

Text of Response: The Southwest Region advises that Sunland Airpark is a privately owned airport. However, a check of the airport reveals that the problem described has been remedied and all runway lights are in operation.

16. Text of AB: Ocean City, MD, Ocean City Airport: Report alleges that many of runway and boundary lights are burned out and require replacement.

Text of Response: Eastern Region advises that lights on Ocean City Airport have been replaced.

17. Text of AB: Anchorage, AK, Merrill Field: Reports cite uncontrolled mix of aircraft and motor vehicles, both ground service and non-aviation vehicles, traversing roads and parking area at south end of field. This portion of the airfield is alleged to be unmonitored by ground-control and uncontrolled-with respect to access.

Text of Response: The airport manager recognized this problem and has assigned security police to maintain this portion of the airfield.

18. Text of AB: XYZ Municipal Airport: Report cites serious difficulty in ground operations due to inadequate maintenance of taxiway and runway markers. Report indicates that markers are overgrown with weeds and/or broken. Photos attached.

Text of Response: On August XX, an inspection of the airport was conducted by Mr. Doe, in response to a NASA Alert Bulletin dated August X, 1976, advising as follows: (text of AB)

The airport's supervisor of maintenance accompanied Mr. Doe during the inspection and when the inspection was completed the findings were discussed with the airport manager. In summary:

A. Grass cutting operations were in progress by one machine and operator. We advise that you seriously consider employing more than one mower during rapid grass growing periods, and that a priority system be initiated beginning with the prime runway with aids, etc. The equipment should be properly "flagged" for pilot visibility, and radio control should be maintained with the tower.

B. The demolished internally-lighted runway guidance sign, located at the intersection of taxiways A and H, must be repaired or removed.

C. Many taxiway edge lights along "A" and the operable portion of "B" were not operating and must be repaired.

D. Many taxiway lights along "B" are not elevated to the recommended 14-in. height above grade and must be corrected. Growing grass can easily obscure visibility. It is our understanding that a maintenance corrective schedule will start immediately to raise these edge lights.

E. At the intersection area of taxiway C and runway, grade smooth and/or cut the high grass. Also fill and grade the low area.

F. The VASI NAVAID serving one runway is not operating. Fuses were changed during the inspection, but to no avail. It is our understanding that you have contacted the contractor (since the units remain under ADAP project guarantee) and that corrective action will be taken immediately. If delivery of replacement parts for the units is a problem, contact the ADO for possible assistance.

G. At the end of runway safety area, cut or remove the small tree and brush growth.

H. Stone debris covered runway north of the intersection and was not noted on the day's daily inspection report. A similar observation was noted during an inspection in March 1976. This situation must be corrected.

I. The daily inspection reports are not in the format required by FAR Part 139. It is stressed that an acceptable format be initiated and, for your use, we enclose Advisory Circular 150/5200-18 dated February 5, 1972.

J. Appropriate pages of the Airport Operations Manual have been reviewed to determine who acts in your absence. Do you have an assistant manager acting in that capacity, or does the organizational chart require updating?

Please respond within 30 days from this correspondence date of the actions taken or to be taken relative to the above. It is our understanding that corrective action to Item H was done on the date of this inspection. We also await your response to our earlier correspondence concerning the airport operations manual.

AIRPORTS: LIGHTING AND APPROACH AIDS

Bulletins 19 and 20 discuss two problems of considerable concern to pilots. The shortening of approach light systems, an FAA policy to conserve energy, is discussed in No. 19 and also in an excellent short bulletin provided by Pan American World Airways and reproduced by permission. Bulletin 20 discusses another issue of concern: The lack of ability of controllers to inactivate REIL flashers without turning off runway lights as well. As indicated in the FAA response to this and other alert bulletins, this matter involves FAA F & E policy which is now under review. Bulletin 21 makes note of this problem and certain others at another location. Bulletin 22 discusses a VASI installation at a new airport.

19. Text of AB: Various locations: Pilot reports indicate that at various airports, approach light systems are being shortened to 1/3 of original length. Dallas Love Field and Billings, MT, Logan Field runway 9 are mentioned. It is pointed out that at RVR 2400, it is considerably more difficult to achieve runway alignment with the shortened approach light systems, and that more missed approaches result, with increased operating costs and increased potential for accidents.

Text of Response: The policy of the FAA on approach light systems is as follows: For runways with a 2.75° or less glide-slope angle on the ILS, the approach lights will be 3000 ft in length; with 3° or more glide-slope angle the approach lights will be 2400 ft.

This is based on the fact that at decision height, normally 200 ft, the first light visible over the nose of aircraft is 3000 ft for the shallow slope and 2400 ft for the steeper angle. In view of the energy shortage, airports having 3000 ft approach lights and a 3.00° or better glide slope, have been permitted to shorten their approach light systems to 2400 ft or 4/5 of their original length.

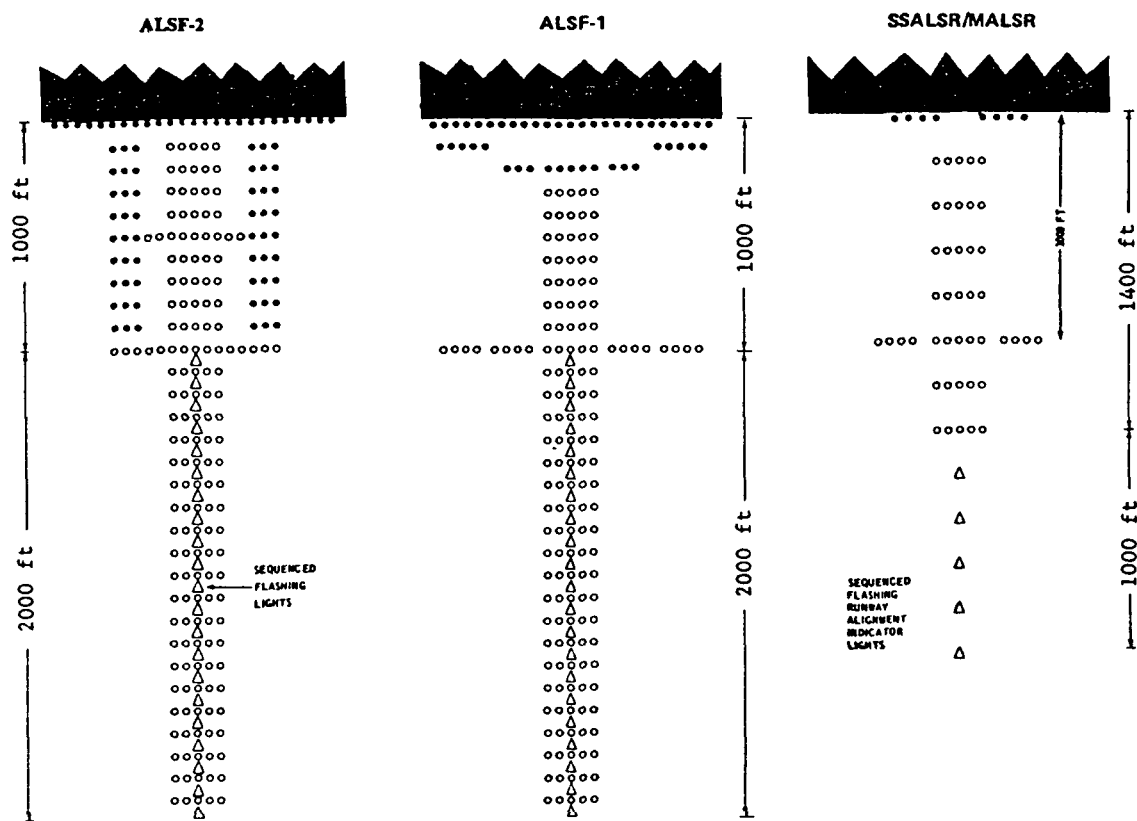
SHORTER AND FEWER CAT I APPROACH LIGHTS

To save energy the FAA is gradually instituting a plan to convert all ALSF-1 approach light systems to simplified short approach light systems with runway alignment indicator lights (SSALSR) or medium intensity approach light systems with runway alignment indicator lights (MALSR). The length of the new approach light systems will be reduced from 3000 to 2400 ft, except for unique approach procedures or topographical conditions. The MALSR will be the new standard CAT I approach light system.

CAT II ALSF 2 approach light systems will remain unchanged for CAT II operations, but when weather is at or above CAT I minima, the lights will be adjusted by ATC to show only a SSALSR display.

All new MALSR systems will be installed with frangible structures and all existing ALSF-1 approach light systems will be retrofitted with frangible structures and converted to MALSR systems at the same time.

After the program is completed in approximately 8 years, pilots flying in the United States at civil airports will see only SSALSR/MALSR systems or ALSF-2 systems.



20. Text of AB: Morgantown, W. Va., Morgantown Airport Runway 36: REIL system is activated with runway lights. Pilots complain of their brightness when near runway in night instrument operations. They are also concerned about potential for disorientation. This problem has been reported at a number of facilities with similar installations.

Text of Response: The REIL system at Morgantown, West Virginia, was installed under Facilities and Engineering criteria which provide that REIL and the runway lights are on the same circuit. A study is under way to resolve this problem to conform with ADAP criteria which provide that the runway lights and REIL are on separate circuits which would allow for the control of these lights separately.

21. Text of AB: Chattanooga, TN, Airport: Recent reports highlight several local problems: (1) Several tower windows have dirt between double panes, limiting vision. (2) Recently installed runway markers for runway 2-20 all indicate "2-20," including those at end of runway 2 and those at end of runway 20. This is causing confusion among itinerant pilots. (3) Lights at airline gates: glare at night interferes with tower monitoring of traffic landing, taking off, and in traffic pattern on downwind and base legs for runway 2. (4) Runway lights and REIL for runway 14-32 are operated by single switch with REIL activated every second switch cycle. When pilots request that REIL be turned off, it is necessary first to turn off REIL and runway lights, then switch must be activated again to turn runway lights back on. Reporter suggests loss of runway lights, even momentarily, during night reduced visibility operations poses a potential hazard.

Text of Response: The four problems outlined in this report have been checked by the Southern Region.

1. The tower window problem has been referred to the proper authorities in Air Traffic.
2. The runway markers referenced appear to be taxiway markers which when going to runway 2 are displayed as 2-20 and when going to runway 20 are displayed as 20-2. The runway itself is marked 02 and 20 and is in conformance with present directives.
3. The lights at the airline gates are being changed to attempt to reduce the glare.
4. The REIL at Chattanooga is being rewired to provide a separate circuit that will not require that the runway lights be turned off when the REIL is turned off.

22. Text of AB: Carmi, Illinois, Carmi Municipal Airport: Power lines on the approach to runway 18 are not noted in the AIM, Part II-Airport Directory listing for this airport. Additionally, a recent pilot report alleges that a correct glide path in reference to the runway 18 VASI will take the aircraft very close to the power lines.

Text of Response: The VASI at Carmi Municipal Airport is set at 3°. This puts the aircraft at 45 ft over the power lines mentioned in this report. In addition, this is a new airport and steps are being taken to have the power company bury these lines.

AIR TRAFFIC CONTROL FACILITIES

Bulletins 23 and 24 illustrate the complexities of maintaining hardware and software in a highly complex, automated ATC system. In the latter report, CCD 3729A, a software modification, was discussed in ASRS Quarterly Report 76-1, page 18.

23. Text of AB: Fresno, CA, Fresno Approach Control/Tower Radar. Several recent reports suggest a substantial problem with ghosting, alphanumerics jumping between targets, ringaround within 10 miles of antenna, and loss of targets below 3000 ft. Ghosting is a particular problem in northeast quadrant. It is alleged that these problems have been reported to Region, but action has not been taken to date.

~~Text of Response:~~ The Western Region Office is aware of the reported problems at Fresno, CA. Regional action has already been taken to shield the military security fences which have been causing the ghosting in the northeast quadrant (contract is scheduled to be signed 11/26). Replacement beacon antenna is being transported from the Las Vegas site; a modification to reduce ring-around caused by the defruiter was installed on the digital defruiter; and regional engineers have scheduled an onsite evaluation of the site during the week of November 29.

From a national beacon improvement plan one of the improved beacon antennas is scheduled during CY-78 for the Fresno facility.

24. Text of AB: Cleveland, OH, Cleveland ARTCC: Controller report cites an incident at 0050Z on 9-7-76, in which "input to 'D' side CRD became frozen but we were still able to receive messages. At 0055Z the track ball on the PVD froze, but targets were still being updated. Approximately 3 min later, the targets stopped updating, yet we had no warning indicating that the RDP was frozen. All positions going to broadband radar did not have control of the RDP, which caused havoc at the sectors involved."

Controller believes CCD 3729-A, Improved Notification of Display Program, had been implemented, yet no warnings of failure were observed during this incident.

Text of Response: Research of the subject incident indicates that the Central Processor backed up due to an error in the use of an on-line subprogram, Bulk Store Edit. This subprogram provides the capability of effecting changes to externally stored flight plans while the NAS functional program is operational. Storage in core necessary to hold the flight plans while the data are being amended, requires the use of a large number of "pool blocks." These "pool blocks" are also shared with radar data being received from the radar sites. Due to an overloading of the system with flight plans, the system deteriorated to a point where the Central Processor had no more radar information. At this point, an Internal Timeout and Central Processor abort occurred.

CCD 3729A, Improved Notification of Display Frozen, was implemented in the A3d2.2 system program which was delivered to the 20 en route centers in April 1976. The CCD was a part of the operational program in use of the date of the incident. The notification of a radar failure was not output to the PVDs due to an abort of the Display Processor coincidental with the backup of

the Central Processor. When an abort occurs in the Display Processor (either the CDC or DCC) no messages of any kind can be output to the PVDs. The Display Processor abort occurred at 0057Z.

Subsequent to this incident, a procedural change has been established at the Cleveland Center whereby a restriction has been imposed to limit the use of the Bulk Store Edit subprogram while the operational program is running. Additionally, the Air Traffic Service is examining the feasibility of developing national procedures to limit the use of this subprogram at any time the NAS functional program is operational.

HAZARDS TO FLIGHT

Bulletin 25 again discusses the problem of parachutists. This problem continues to crop up in various locations. Existing mechanisms for disseminating information regarding skydiving activity appear to be adequate if all such mechanisms are used, but ASRS reports suggest, as in this case, that there may be a substantial lag between activity and information dissemination.

25. Text of AB: Two previous alert bulletins have referred to potentially hazardous conflicts between skydivers and aircraft (76-1.1, 76-24). The response to 76-1.1 indicates that the area is an officially designated drop zone; 76-24 outlines a situation in an area where AIM does not indicate a drop zone. Since then, reports from Denver, CO, indicate extensive parachuting activity on the DEN R-321, 18 miles from the VOR, in an area which conflicts with inbound traffic, especially to runways 17. Jumps are from 12,000 to 16,000 ft; arrivals are descending from 20,000 to 11,000 ft and occasionally to 8000 ft. Reports allege that numerous VFR pilots have had close encounters with parachutists. Area does not appear to be a designated drop zone, although it is said that activities are being conducted under a letter of waiver issued by Rocky Mountain Region. Reporters state that too often communications with jump aircraft are impossible because of traffic volume on approach frequencies. They believe that a serious hazard exists because of traffic transiting this area.

Text of Response: The area referred to above has not been designated as a drop zone, nor have any waivers been issued by the Rocky Mountain Region.

Action was initiated on 11/11/76 to have the area designated as a drop zone and be published in Part 4 of the AIM. It will also be published on the Cheyenne sectional charts.

Recent changes to the arrival traffic flow into the Denver terminal area have reduced the traffic congestion in the area in question.

Bulletins 26 and 27 describe certain aspects of another serious problem about which reports have been accumulating since the ASRS began. It is apparent that the provisions of AIM Part 1, ch. 3, Airport Advisory Services, are widely misunderstood by pilots. The following report to ASRS is typical, another was shown in ASRS QR-2, p. 45, no. 11.

Text of ASRS report: "Every weekend I fly in and out of the Bullhead City Airport in Arizona. It is a very nice airport, and is visited by approximately 75 general aviation planes each weekend. These planes range from Turbo Prop Twins and smaller.

"This Airport does not have Uni-Com, and a very confusing situation exists. The users are about equally divided on whether to use 122.8 or 122.9, to call out position and intentions. I personally understood that about 4 years ago a ruling was made to use 122.9 under these conditions; however, I could be mistaken. There has been some near misses due to landing planes – having the sun behind them, and not being on the same frequency.

"I am certain that unless something is done, a serious accident will happen in the future.

"If a Notice, defining the correct frequency, was placed in the Bulletin Board in the Pilots Lounge, it would help. I would be glad to assist in placing such a notice. The best solution would be to have signs placed on the taxi ways, which would have to be done by the airport management."

An FCC notice of proposed rule-making was issued on May 26, 1976, in response to requests from AOPA and others, whose intent was to make additional VHF channels available for use at uncontrolled airports. It is hoped that a new regulation will decrease frequency congestion, but the problem of misunderstandings will still exist unless the entire aviation community assists in improving pilot awareness of the correct procedures to be used under these circumstances.

26. Text of AB: International Falls, MN: Reporter describes a head-on conflict with landing air transport-type aircraft while taking off into wind. He alleges that these aircraft frequently land straight in, downwind. Airport is uncontrolled.

Text of Response: An airline operates transport type aircraft into International Falls Airport in accordance with the provisions of FAR 91.67 and Advisory Circular 90-66. Straight in/downwind landings are made with tail winds up to 10 knots; however, the landings are accomplished only after close coordination with Airline personnel on the ground who have visually cleared the traffic. A radio transmission is made in blind over Unicom frequency (122.8 MKZ).

One problem was noted where three (3) trees, located between the Airline's "Ramp-Mike" operators and the take-off end of runway 13, may have prevented the "Ramp-Mike" operator from observing a small aircraft on the end of runway 13 getting ready for takeoff. The trees have been removed and the problem no longer exists.

27. Text of AB: Additional reports (see AB-1, item 13) about proper frequencies for blind communications at tower-controlled airports during times when tower is not in operation. AIM part 1, ch. 3, Airport Advisory Services, refers. This section may need reemphasis to airmen.

Text of Response: We do not feel reemphasis of recommended procedures in AIM would resolve the problem cited by ASRS-AB76-8. Anytime an aircraft operates to or from an uncontrolled airport there could be other aircraft in the immediate area and caution should be exercised. Even if communications may be established with another aircraft on the non-operating tower local

control frequency, or with an operating FSS or UNICOM which may be able to furnish some traffic advisories, wind, runway in use, and traffic flow information, caution should be exercised. All aircraft may not be communicating as recommended. A caution to this effect is stated on page 1-40 of AIM.

MILITARY-CIVIL COORDINATION

In NASA QR-2, Alert Bulletin 4, p. 21, dealt with blocks of airspace reserved for military air refueling and other special operations. An additional response has been received from FAA regarding control of such special operations. The Bulletin and this response are quoted (No. 28). Bulletin 29 describes a local situation compounded by lack of radar coverage.

28. Text of AB: Several locations: Several reports received from controllers and pilots suggest possible misunderstanding of the rules and procedures governing the use of airspace blocks outside restricted airspace made available for military refueling and other special operations. Such airspace, governed by MARSA concept, is used by civil traffic under ATC control, but ATC personnel may be unaware of intent of military traffic while civil traffic is transiting the blocked airspace. Two recent occurrences have involved AR-100, though other blocks have been cited also. It appears that military pilots believe the space is actually blocked for their exclusive use during a period of time, but that ATC feels free to use the space, or a portion of it, provided radar separation is maintained. This has led to conflicts because military pilots did something other than what ATC expected them to do.

Text of Response: Procedures governing special operations conducted within refueling areas, military operating areas and ATC assigned airspace are coordinated with the military services and documented in FAA Handbook 7610.4C. From this parent document, appropriate controller and pilot directives are generated by both the FAA and the military.

We are aware that misunderstandings have developed with regard to the MARSA concept and we are currently coordinating a significant change to FAA Handbook 7610.4C to more clearly define responsibilities. This will result in written directives and briefings to controllers and aircrews to insure complete understanding.

29. Text of AB: Monroeville (Alabama) VORTAC, Montgomery Low Sector R-13 (Atlanta ARTCC): Navy aviation training operations are reported to be creating a conflict situation in the area of the Monroeville VORTAC. Flying in the area around, but outside the boundaries of Restricted Area A-292, the training aircraft are alleged to be operating under visual flight rules but flying at IFR altitudes, entering Positive Control Airspace without an IFR clearance, and frequently saturating the airspace above the Monroeville VORTAC — particularly between 3000 and 6500 ft (AGL). The reporter contends that since the affected area is one of limited radar and radio coverage below 5000 ft (AGL), the nature of the training operations creates a particularly serious potential for conflict between all types of air traffic.

Text of Response: There have been several exchanges of communications on this subject between the Atlanta ARTCC and the Naval Air Station at Pensacola since August 1975. The Atlanta Center maintained a 6-months' running log of activities such as sightings by IFR aircraft and observations of incidents where an untracked Mode C target entered APC. No positive identifications were ever possible; however, the frequency of these occurrences was diminished after these reports were forwarded to the Navy. The Navy T-28 trainers use the Monroeville VORTAC for radio navigational training during VFR conditions employing the see and be seen concept.

Reports of civil-military problems related to low-altitude, high-speed flight have resulted in submission of two alert bulletins. A recent ASRS report typifies those which have been received. Another is quoted in an alert bulletin which prompted a detailed response that will be of interest to all civil pilots. The actions being taken should improve the current problems of obtaining information considerably.

Text of ASRS report: "I departed Charlotte, NC about 9:08 a.m. est, enroute for _____, SC. I climbed to 3500 ft MSL, was in radar contact (Stage III ARTS) with Charlotte Departure Control. Had a discrete code. About 1.5 miles N.W. of Monroe Airport (20-21 miles from CLT), and while talking with CLT D.C. about a Cherokee, I noticed a jet (F-4) approaching very fast at 9:30 o'clock, a half mile or less away. The F-4 was at the same altitude (3500 ft) and was heading straight for us. I jerked back on the wheel and the jet passed straight under us less than 100 ft away.

"The jet did not make any evasive maneuvers that I could see. I feel that if I hadn't jerked back on the wheel, he would have hit us. I estimate the jet's speed to have been over 400 knots. There was no damage to my plane or injury to me or my passengers.

"The weather at the time was clear sky, visibility over 20 miles with a smoke and haze layer.

"The jet was not in radar contact with CLT. The controller said later when I talked to him about it, that he did not see the jet at all.

"A small jet flying that fast is very hard to see, I just happened to look at the right spot at the right time. I think they (military jets) should be required to at least squawk VFR so the controller could give us some help seeing them. This jet wasn't. I know the pilot is responsible for looking for other planes and avoiding them, but he could be looking out the right side the few seconds it would take a jet on the left to run all over him. To the best of my knowledge there is no low-level route where the jet was flying. So I think stricter control is needed over the low-level, fast moving jets. Have already filed a report with the FAA."

Note: There is a requirement that all military aircraft squawk VFR 1200 at all times unless otherwise ordered by ATC (FLIP GP, p. 5-28a).

30. Text of AB: Various locations, Military VFR Training Routes: ASRS has received a substantial number of reports about low altitude, high speed military traffic. Specific problems have been cited in previous alert bulletins. A recent report, however, contains a very clear summary of the general problems in that area:

“On September XX, 1976, at 1300 local time, I was conducting a training flight . . . at 3000 ft MSL. We were practicing maneuvers in airspace overlying a low altitude military route. As we were proceeding north, I noticed a trail of black smoke, obviously originating from a high speed aircraft. As the traffic closed on us, I could see it was a military Phantom F-4. His altitude was approximately 2550 to 3000 ft MSL and he was going south. I climbed sharply and successfully avoided him. The amount of time I had in which to make this decision was only seconds. Approximately 3 min later, I observed a second F-4 flying the same route and altitude.

“The information we have about this low altitude route is that the aircraft involved will be at 1500 ft AGL or less. The planes I observed were more than 2000 ft AGL while in my area. If these aircraft continue to fly outside the published route at high speeds, a real hazard exists.

“The lack of information published about these routes creates a hazard, too. The local people are somewhat aware of the route, but transient aircraft have no immediate source of information that we can find. The main problems seem to be:

1. Airman's Information Manual offers no information on location and altitude of routes.
2. There is no procedure for notifying the local control towers when the route is active.
3. Sectional charts offer no information.

“I feel these steps should be taken:

1. See that the aircraft flying the route stay in the airspace assigned for the route.
2. General information on the locations and altitudes of these routes should be made more available to all pilots.”

Text of Response: We agree with the concern expressed in the report. The problem, however, is not quite as straightforward as stated in the report.

In 1967 the military services were granted authorization to operate at speeds in excess of 250 KIAS below 10,000 ft MSL to the extent required to fulfill their military missions. Subsequently, a route structure called the TR routes was created for VFR operations below 1500 ft AGL and an agreement reached that operations at this altitude would be conducted only on these routes. No equivalent structure was ever created for operations above 1500 ft AGL.

We agree that information on the TR routes is not as available as it should be, but the allegation that aircraft above 1500 ft are violating the route confines is unfounded in that no route structure exists above 1500 ft and the operations are perfectly legal.

We do have programs under way to rectify the situation. Our highest priority action is being directed toward the operations above 1500 ft because *no* information is available on operations in this structure. We intend to effect improvement to the TR structure, especially in the publicity area, but as a second priority to the above mentioned structure.

Following is a summary of our activities in this program:

1. The 1967 speed authorization has been rescinded and replaced by one requiring all operations below 10,000 ft in excess of 250 KIAS be conducted in Restricted Areas, Charted Military Operating Areas or on published routes. Mandatory compliance date is July 1, 1977.

2. Route structure criteria has been developed and evaluation routes are presently being flown in the Southeastern U.S.

3. Routes will be charted in civilian publications and publicized in the news media and by graphic hand-outs to pilots provided by flight service stations, General Aviation District Offices and airport owner/operators.

Although the TR route structure is unaffected for the present, improved charting and publicity techniques are to be pursued as soon as we get the new route structure underway. This should be within the next few weeks.

APPENDIX B

EXAMPLES OF AVIATION SAFETY REPORTS

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As in the previous quarterly report, this appendix is devoted to the presentation of ASRS reports that illustrate problems amenable to correction by individual awareness. It is hoped that these examples may be useful to the FAA and to organizations in the aviation community in their continuing efforts to improve safety awareness within the community.

Readers of these reports must keep in mind that they are the perceptions of the reporters, unverified by independent investigation. Errors of fact may therefore be present. Where presentation of the texts as written might result in the identification of persons involved in these occurrences, the reports have been paraphrased or identifying material removed. Recommendations are those of the reporter.

RULES AND PROCEDURES

Several ASRS reports have pointed out that traffic conflicts can occur at airports served by instrument approaches when a control tower is not in operation or there is no tower serving the field. These conditions can exist at a number of airports. Report No. 1 is a recent example. Report No. 2 deals with another frequent topic of concern: the behavior of general aviation traffic at uncontrolled airports. Reports 3 and 4 discuss "pilot's discretion" clearances and the assumptions on which they are predicated.

1. Submitted by pilot:

It has come to my attention that Torrance ATC Tower closes its operation daily by closing its airport traffic area and its control zone, thus making Torrance an uncontrolled airport. However ATC allows IFR traffic to make VOR and localizer approaches to this uncontrolled airport.

During this uncontrolled condition (2200-0600 local time) it is possible for a no-radio aircraft to operate in the traffic pattern (below the 700 ft all transition area) in basic VFR conditions of 1 mile visibility and clear of clouds.

During this time an IFR aircraft could be cleared for an IFR approach when weather conditions are IFR in controlled airspace and VFR in the uncontrolled airspace around Torrance airport (i.e., 700 ft ceilings and visibility 1 mile).

The IFR aircraft could be descending IFR to his DH or MDA while a VFR no-radio aircraft is on final just below the cloud bases. Both aircraft are flying legally; however, a mid-air situation is very possible without any warning or visual contact by either aircraft. (This condition has been nearly a mid-air for myself and 4 passengers.)

If control zones were in effect 24 hours a day with or without tower operation and using approach or departure control as controlling agencies, no aircraft could operate to or from or near an airport that has IFR approaches unless the weather was VFR 1000 ft ceilings, visibility 3 miles, cloud clearances 500 ft below, 1000 ft above and 2000 ft horizontally, or have an ATC clearance when below VFR.

2. Submitted by pilot:

In both cases I observed from about one-half mile.

Case 1 — Aircraft A was turning from base to final when he saw aircraft B coming straight in probably from Brooke VOR. He pulled up and did a right turn. At closest point aircraft were about 300-400 ft apart.

Case 2 — Aircraft A was turning from base to final. Did not see twin coming straight in. Twin saw aircraft A late and pulled up abruptly. At closest point aircraft were 100-200 ft apart.

Both impressed me since I was back in the pattern. While I'm new at flying, these incidents impressed me as they occurred at two different fields within the hour for the same reason. In each case, one of the aircraft was making a straight-in approach probably from the nearest VOR in both places at uncontrolled fields without instrument approaches. Considering these were approximately intercept courses, they were too close, especially the 2nd where the pilot (who was at fault I believe) put the plane on end to avoid the other aircraft. Flying the pattern should be mandatory at all uncontrolled fields without published approaches. It might even be good to require crossing the field at 500-above pattern altitude and then make a descending turn to enter the pattern. Boy! It sure has caused me to keep an extra keen, twisted neck, look around when in the pattern for approach.

Some of these pilots are nuts!

3. Submitted by controller:

Airline aircraft A proceeding westbound along J118 at FL390 inbound to Huntsville TN (HSV) and an enroute airline aircraft B proceeding northeast bound along J22 at FL370 passed within 3 n. mi. and 1200 ft of each other in the vicinity of the Chattanooga, TN VORTAC (CHA).

Upon entering my sector (approximately 60 n. mi. East of CHA) A was issued a clearance to descend from FL390 to FL350 (bottom altitude of my sector) at pilot's discretion and instructed to contact the center controlling the airspace below my sector. I realized that B could be traffic for A; however, HSV lies 74 n. mi. west of CHA and should be well below FL370 (B's altitude) on crossing CHA. (B was 70 n. mi. southwest of CHA at this time). A was approximately 25 n. mi. east of CHA, it was noted that A had not vacated FL390. After reviewing the situation, I felt the northeast bound B aircraft could be vectored slightly to the east and taken behind A.

B was turned 15° right and the assistant controller began calling sectors below our own in an attempt to have the A maintain FL390, for at this time it appeared as if A were turning to the southwest negating my vector. A began descending before he could be stopped but was instructed to return to FL390. On noting the turn and descent of A, I instructed B to fly heading 090 and seconds later A passed 3 n. mi. north of B.

Factors relating to cause:

- Assumption that aircraft would perform as experience dictated
- Use of pilot's discretion descent clearance

Suggestions:

Discontinue use of pilot's discretion descent clearance. This procedure would tend to force resolution of even the remotest possible conflicting situation (such as this one) before the aircraft was transferred to another frequency.

4. Submitted by pilot:

Our flight was enroute to ORD on J-101 between STL VOR and CAP VOR at FL370. At approximately 60 DME SW of CAP VOR, Kansas City Center cleared us to cross 10 DME NE of CAP at FL330. The co-pilot was flying and having more than ample time to descend, he elected to remain at FL370 for a while. As we approached the point where we should have begun our descent, we became preoccupied with our routing after CAP. (CAP 032° radial and PNT 214° radial PNT, PNT 005° radial and ORD 235° radial ORD). While checking the routing and determining our outbound course we failed to begin descent. The controller questioned our altitude just after station passage and the co-pilot began descending. But it was apparent that we could not reach FL330 by 10 DME NE of CAP so I asked for a vector. Since there was no conflicting traffic the controller allowed us to continue on course and switched us over to Chicago Center. Chicago then cleared us to descend to FL230 and we proceeded enroute to ORD.

Remarks:

A clearance to descend at pilot's discretion is a valuable aid to good fuel conservation; however, it does leave the pilot vulnerable to becoming preoccupied with other duties if the clearance is given too soon.

In our situation, an earlier detection by the controller that we had not started our descent would have been most helpful.

The altitude alert system has proven invaluable in the cockpit as a reminder to stop a climb or descent. Unfortunately, there is nothing we can set to remind us when to start a delayed climb or descent. Therefore, we need as many crosschecks as possible to avoid oversights.

Report 5 deals with non-detection by ATC of a triangular pattern flown during an emergency. Many pilots may be unaware that the use of this emergency pattern has been discontinued. Report 6 is an excellent, detailed discussion of the sometimes unfavorable interaction of weather, airport geography, environmental considerations and the demands of air traffic as they affect pilot decision-making. Report 7 again illustrates problems which pilots face in meeting ATC requirements.

5. Submitted by pilot:

Basically what happened was — I, as the pilot of a light single engine transport aircraft descended, after making three left-hand, 2-min leg triangular patterns to signify an emergency at 9500 ft MSL, apparently entirely undetected into the Minneapolis-St. Paul TCA. I had flown one or two

more triangles on entering the TCA at 8000 ft MSL and then made a long – 5 or 10-mile final onto 29L, landed uneventfully and taxied off the runway as quickly as possible. I had descended on final at 140 mph decreasing to 120 mph, and then 110 mph on short final – all of which was comfortable and possible in the aircraft. When I phoned the tower after leaving the aircraft parked next to an airliner – the tower was totally unaware of the landing. There had been no emergency equipment awaiting the aircraft to land, and no light gun from the tower. My reason for declaring this undetected emergency was no electrical power in the aircraft (as verified by GADO-14) – and low fuel quantity indicated maybe 1 hr remaining. I wanted to land at an airport easy to find and where, according to even FAA publications, there would be a small (only) possibility of collision because of radar separation by the tower below and Farmington ARTCC a few miles to the southeast. Perhaps the radar scopes were turned down low, perhaps little enough attention is or was given to the radar display – perhaps a video radar recorder will tell about this.

6. Submitted by pilot:

Comments regarding occurrences at Seattle/Tacoma Airport: These comments are not a criticism of the manner in which my flight was handled by ATC facilities; the flight was handled in an exemplary manner. These criticisms are directed to the criteria for preferential runway uses at SeaTac Airport which controllers and pilots alike must accept or, even worse, may accept rather than facing the consequences of contrary action.

Occurrence: We departed PDX for SeaTac via stored flight plan at 16,000 ft. Weather at SeaTac 600 broken, 1000 overcast, light rain, wind 290° at 6 knots. SeaTac ATIS then indicated 200 scattered, 600 scattered, 1000 overcast, wind 290° at 6, ILS approaches in progress runway 16R. On original contact with Seattle approach, wind was given as 310° at 5 knots, variable from 290 to 020. At this point a request was made for an ILS approach to runway 34R. Controller advised that there would be a 15-min delay for 34R; the delay was acknowledged and approach furnished vector holding for the anticipated delay. In response to queries from approach, the information was communicated that the flight did not wish to land downhill and downwind on a wet runway. It was later noted that ILS 16R and 34R could not be operated simultaneously; approach advised we would get the 34R ILS prior to the turn on. Then flight received a few minutes additional delay and was then vectored for a VOR approach to 34R. No explanation was given for the VOR approach nor was one asked for. Reported weather was well above minimums for a VOR approach. When the approach was made there was no ground contact at MDA and a missed approach was declared. The flight was handled well and turned downwind east of the airport for vectors for an ILS approach to 34R which was subsequently executed. During the vectors the new ATIS indicated 200 scattered, 600 scattered, 1000 broken, light rain, and wind calm. At the outer marker the wind was reported 350° at 4 knots. Weather at the approach end was 200 overcast and light rain; the runway and approach lights came into view just prior to reaching DH.

After discussion with controllers, it is my understanding that runway 16R is used to every extent possible for landings and departures within aircraft operating limitations and FAR because of the traffic conflict that occurs with Boeing Field on runway 34 departures and noise abatement for the SeaTac area.

Comments: It seems inexcusable from this pilot's standpoint that a preferential runway would be assigned under conditions of a tail wind component, and a downhill runway with less than

normal braking condition on the runway. When an over-run incident occurs, the questions that are asked of the pilot are: Was the most appropriate runway used for the conditions that existed? Was there an alternative available to the pilot and did he request an alternative which would have been more appropriate? If no such request was made, why not? The questions asked of a controller in such a hearing are invariably: Did the pilot request another course of action than that taken and would such a request be honored? I have never heard of a controller refusing such a request. In this case, the intent of my request was followed.

Thus brings up two considerations: In honoring a request that a flight be handled in conflict with all of the other traffic in the area, a heavy workload is placed upon the controller. Also, it is extremely difficult for a controller to understand why one flight out of many will suddenly make a request that is contrary to the acceptance by all other pilots of the runway in use.

It would seem then that either one of two courses is open to us: (1) The assignment of a preferential runway should be considered carefully in view of the conditions under which such a runway is to be used. All factors must be considered. It does not seem to me prudent to use 16R as the preferential runway in Seattle under the conditions that existed. The fact that many pilots will execute an approach and landing under these conditions in no way mitigates the known hazards of such an operation. Pilots, by their very nature, do not wish to operate in conflict with ATC or operating rules. Also, the fact that everyone else is doing it makes it even more onerous to request something which is not the accepted norm. The better course to follow would be to reassess the conditions for runway and approach assignments for SeaTac taking into consideration the factors affecting landing distance and other operational conditions. Such conditions may at times result in delays but let's face it, delays in inclement weather are acceptable.

One other point with regard to weather. If ceiling measurements had been available at the window for the VOR runway 34R approach, it is quite obvious that our flight would not have been cleared for such an approach, or would not have accepted the approach even if cleared. Weather observations are rarely taken where it is most appropriate for the approach being conducted. The installation of runway visual range transmissometers has helped but has not solved the problem of providing the pilot with the conditions he will experience upon reaching MDA or DH. In fact, subjectively, I believe, it has created great temptation to cheat on the minimum altitude, in the belief that "just 50 more feet and we'll be able to see the runway." This is a serious threat to the safety of any operation in inclement weather. On the other hand, if we had real data available on weather at the appropriate places it would relieve to a great extent such temptations.

7. Submitted by pilot:

After departing the intersection at an altitude of 11,000 ft, the flight was vectored for a visual approach to runway 17L.

The vectors and descent clearances issued by approach control resulted in the aircraft intercepting the final approach course at a position inside the outer marker at an altitude of 3000 ft.

As no safe approach to the runway could be executed from this position and altitude, the flight advised approach control that it was "unable" to complete the approach. The flight was then vectored for a second approach.

While being vectored for the second approach, the flight was instructed by approach control to maintain 190 knots air speed.

The vectors and instructions issued by approach control during the second approach again placed the aircraft in proximity to the landing runway at an unrealistically high altitude, and this time, at an unrealistic air speed. However, through the use of abnormal thrust settings and flap management procedures, a successful landing was accomplished from this approach.

From operating experience into this airport during the past 6 months, it is apparent that this procedure of placing aircraft in the position of being too high and too fast to complete an approach is not an isolated incident.

During the course of the second approach by us on this date, another air carrier's aircraft was overheard voicing the same complaint.

Discussions between this Captain and certain supervisory personnel also reveal a general awareness of the chronic nature of this situation. These discussions also indicate that some effort has been made by the supervisory personnel to correct this problem but that these efforts have been unsuccessful.

HUMAN AND SYSTEM PROBLEMS

Report 8 deals with parachutists, operating entirely legally. It illustrates the problems that can occur despite full adherence to the procedures laid down for such activity. Report 9 describes a bird strike followed by good thinking and procedures by the affected pilot. Less effective procedures culminated in a forced landing in report 10. Report 11 covers a situation that has been reported several times: flight under ATC control beyond gliding distance to land. The FAA's concise response to an earlier alert bulletin covering this topic is also quoted; this is a situation in which ATC controllers do not have sufficient information to help a pilot remain legal unless the pilot gives it to them. Report 12 again illustrates problems related to traffic patterns at uncontrolled airports.

8. Submitted by Flight Safety Officer; supplied by USAF:

A flight of two fighter aircraft had been vectored to a heading of 050° to intercept the extended initial for a visual overhead pattern to runway 14 at Hill AFB. At 1355 MST the flight was cleared by RAPCON for the visual entry to initial. They were on a heading of 050° and west of the initial approach course. They overshot their turn which placed them somewhat east of the extended initial at 6800 ft. At approximately 1356 RAPCON advised them of parachute jumping "three miles east of Ogden" airport. Approximately 8 n. mi. out on the Hill TACAN (about 3.5 n. mi. northwest of Ogden Municipal) the pilot observed a light civil aircraft above his altitude at his 11 o'clock

position and a parachute opening at his 10 o'clock position 300-500 ft above his altitude and approximately 200 yards away. He continued his approach without further incident.

The extended initial to runway 14 passes directly over Ogden Municipal Airport. In his report the pilot indicated that he had been vectored east of the initial by RAPCON. RAPCON tapes reflect that the flight was cleared for a visual overhead approach while still on a 050° vector and that the pilot overshot the turn after being given his visual clearance. It appears that the deviation was not excessive for normal circumstances. The parachute jump had been approved by the Ogden Airport management in accordance with FAR Part 105.17. It had been coordinated with controlling agencies and the flight notified. All aspects of the operation were legal. In the past Ogden Tower has tried to restrict jumping at Ogden. They lack the jurisdiction to do so. Ogden Airport management has taken action to restrict jumping to certain areas and altitudes on their airport. The restrictions vary with the skill of the jumpers involved. In view of the Hill AFB traffic crossing Ogden, I believe any parachute jumping there is excessive and extremely hazardous.

9. Submitted by pilot:

After about 5 min of flight from the Gwinnette County Airport, heading southeast at 2500 ft MSL, level, indicating 140 mph, a flock of birds estimated 6-12 in number, appeared head-on to my line of flight. Before I could take any evasive action they passed the aircraft with one bird impacting on the starboard wing lead edge about 1/3 distance of wingspan from fuselage. The bird exploded on impact with a thud leaving a 6-in. indentation in the leading edge of the wing. Aircraft was slowed and a landing configuration approach to a stall was executed to check for slow speed controllability. When no problems were encountered, aircraft was landed without incident at base of origin.

I cannot think of any way to avoid this type incident due to small size of birds and closure rate.

10. Submitted by pilot:

The purpose of the flight was to both determine proper engine operation after installation of carburetor and pilot refamiliarization.

The auxiliary fuel tank, which is placarded for level flight use only, was used for takeoff and at about 200 ft AGO the engine rapidly and smoothly lost power.

The mixture required considerable leaning almost to the idle cut off position to develop full power during takeoff, and when engine failure occurred I was so preoccupied with applying carburetor heat and varying the mixture control setting thinking the carburetor malfunctioned during these 5 sec that no thought was given to switching tanks to the main tank which had a few gallons in it. I established a glide to a nearby clearing and landed with no damage or injuries.

I feel the failure occurred with my improper use of mixture control and the premature landing could have been avoided if I had not used the almost full right auxiliary tank. I should not have conducted the flight with a known engine malfunction and a low fuel supply in the main tank.

11. Submitted by pilot:

The unwary pilot who trusts ATC to look out for his best interests may find himself off-shore well beyond his gliding range to land – while following ATC clearances and instructions. Pilot and passengers may be uncomfortable, however, in the case of the for-hire pilot, he may be in unwitting violation of either or both FARs 91.33(b)(11) and 135.147. A specific example is the ASR approach to runway(s) 24 at Daytona Beach. If the pilot accepts an ASR approach while runways 24 are in use, he probably isn't going to know (since ASR patterns aren't published) that he is going to be sent several miles off-shore during the procedure. Another example is the standard IFR routing from the north to the Ft. Lauderdale and Miami area airports. This routing is to the LONNI intersection – some 5.5 n. mi. off-shore. Once again, the for-hire pilot may be in unwitting violation of the FARs unless he has 4000 to 5000 ft of altitude – which is unlikely that close in to the destination.

Text of AB, 5-27-76:

Coast approach radar, VOR-A approach to Fullerton, CA: Pilot reports radar vectoring of single engine aircraft west of V-23 beyond gliding distance from land. Pilot reports two instances of actual IFR vectoring to 5-10 miles west of shoreline, contrary to FAR 91.33(b). He also reports similar problem at Santa Barbara, CA, under IFR.

Text of Response:

FAR 91.1 Applicability states that Subpart A – General, describes rules governing the operation of aircraft within the United States.

FAR 91.3 Responsibility and authority of the pilot in command states that the pilot in command is directly responsible for and is the final authority as to the operation of that aircraft.

In the case of FAR 91.33(b), ATC does not know if any of the instruments and equipment listed is missing, malfunctioning, or not available. The pilot must inform ATC if he is not permitted or equipped to fly offshore, or that he does not desire to fly offshore, whichever the situation. ATC will respond and inform the pilot of the alternatives.

12. Submitted by pilot:

I was flying a low wing trainer, and landing at the Glenwood Municipal Airport. This is the first time I have ever been into this airport. It lays in the bottom of a canyon with narrow walls on each side. As I approached the north end of the airport I saw a plane taking off and making a left turn into the pattern. I followed it in the pattern until I was at the end of the south edge of runway and then made my turn onto base and final. The wind was blowing considerably and this caused turbulence keeping me very busy keeping plane in correct attitude and keeping lined up with runway. As I made my turn onto base I saw other aircraft and it looked to me that it was going on around in the pattern. After landing and almost at the end of my rollout, other aircraft landed to my left and ahead of me. After parking my plane the pilot of the other aircraft approached me and introduced himself and informed me that he was an instructor and that he was going to report me

for a violation. I do not feel I made a violation. I now understand that he was making a long approach and I evidently went ahead of him on my base and final, but not intentionally.

To prevent an occurrence of this happening in the future, I will make a practice of flying above the traffic pattern of an airport that is uncontrolled and looking the situation over thoroughly before making any attempt to land. I feel that is a good lesson to me and though I do not feel I was completely at fault for this incident I plan to never have another of the same.

Report 13 illustrates a problem relating to TCA design. This topic has been discussed in many reports and will be the subject of a systematic study by ASRS. Reports 14 and 15 are examples of another problem that is comparatively common, that of VFR flight above clouds by non-instrument rated pilots. It appears that efforts to educate pilots to the dangers of such activity have not been uniformly successful, despite the considerable amount of material available in the lay press.

13. Submitted by pilot:

At approximately 1715 local time, we were on the 018° radial of Joliet VOR, 19 DME, outbound to Palwaukee Airport (Wheeling, IL). The flight originated at Paducah, KY. We were at 1700 ft MSL, below the floor of the TCA sector. The NAV lights, rotating beacon, and landing lights were on and operational. Two pilots were flying and one was in the back.

Approximately 3 min before the incident, the pilot in the back and myself spotted the other aircraft. He was at our 1 o'clock position at approximately 4 miles. During this time, I was switching from the Palwaukee ATIS frequency back to Chicago approach, which we were monitoring. I then tried to reestablish visual contact with the other aircraft (there were other targets around, VFR and IFR), but failed. His NAV and beacon lights must have blended well with the city lights (especially the sodium-vapor street lights). Then at approximately 1715 local time, the aircraft was spotted at our 2 o'clock position and a half mile and closing. Evasive action was initiated. We descended from 1800 MSL to 1600 MSL. The other aircraft passed over us, northwest bound. I doubt he ever saw us.

I contend that the TCA was the causing factor. The average ground elevation in this area is 600 ft MSL. To remain legal with the FAR's, you then should be flying at 1600 ft MSL. The floor of the TCA in this area is 1900 MSL, which in effect, leaves 300 ft of flying space. And traffic is crowded because of the many airports around (Aurora, Joliet, DuPage, Elgin, etc.).

I suggest that (1) the floor of the TCA be raised to 2500 ft MSL, or (2) eliminate the TCA and initiate straight-out climb corridors for each of O'Hare's runways. This would free more of the unused space (IFR) for VFR traffic.

14. Submitted by pilot:

I departed Albuquerque International on the morning of Tuesday, Jan. 4, 1977, in our company plane with my wife and infant son aboard. We were on our way home from Santa Cruz, Calif., where we had spent the Christmas holidays. I called flight service at Albuquerque, where the

weather was clear, and was informed that the weather east of Tulsa was not good, but, as I recall, was expected to improve. I elected to fly as far as Tulsa where we would stop for fuel, lunch and another weather check. After taking off at Tulsa, I discovered the cabin door was ajar, and returned for a landing to close it. And as we proceeded east I called various FSS's for Nashville weather and was told that Nashville was reporting 1500 broken and something like 7 miles, as near as I can remember. We were flying VFR on top at 11,500 ft. We entered Tennessee about dusk and I called Memphis Radio and was told Memphis was IFR but Nashville was still VFR. I don't remember exact conditions, but I still figured that I could descend over Nashville and maintain VFR. However, upon leaving Memphis Center frequency and contacting Nashville ATIS, I discovered that Nashville had gone IFR. I contacted Nashville Approach and asked for a special VFR clearance, but this was denied because of darkness. I went back on Nashville FSS frequency and asked for information on other airports within my fuel range of about 2 hr, and was told of only one and that was Bowling Green, which was reporting 1000 ft and 3 miles. By this time, I had consumed about another 45 min of fuel and with the knowledge that conditions at Bowling Green were not any better for descent than Nashville, and since Nashville had radar, I could not see any advantage in using the necessary fuel to go there and encounter basically the same problem as I now faced. Therefore I elected to declare an emergency and ask for a radar approach to the Nashville airport, and this request was granted and was expertly handled by the controller.

In my opinion, where I made my mistake was in not allowing enough margin in the weather, even though VFR conditions existed, and not insuring the descent in VFR.

These are the details as near as I can remember, and in retrospect it is easy to see how I went wrong, but at the time I felt confident with my course of action. I feel that this was a lesson well taken, and it surely encouraged me to obtain my instrument rating as soon as possible. I am currently enrolled in an instrument training course and since this incident have taken my written FAA instrument flight exam; the results are still unknown at this time. I have about 20 hr instrument training and approximately 250 hr TT, with approximately 100 hr in type.

15. Submitted by pilot:

On a flight from Vicksburg, MS, to Denver with a planned fuel stop in Tulsa, I climbed through a broken ceiling to 12,000 ft on top. I headed toward Monrow VOR and then to El Dorado VOR — the tops of the clouds kept getting higher and when I reached an altitude of 16,000 ft it became obvious that to continue on course it would be necessary to enter controlled airspace above 18,000. Rather than do that, I turned back. By this time the cloud cover had filled in below me. Greenwood, MS, was reporting a broken ceiling, but upon reaching the Greenwood VOR I found that the clouds were solid. I then called Greenwood and told them my problem — on top, non-IFR rated and ice in the tops of the clouds. Rather than use any more fuel trying to find an area with a hole I elected to descend through the clouds. Greenwood had me call Memphis Center, which I did. They gave me a vector and I descended through the clouds. I broke out under the overcast at about 13,000 above a broken layer of clouds. I requested permission to circle down through a hole in the lower layer, which I did. I landed at Greenwood, fueled, and continued my trip VFR under the cloud cover.

When I landed at Greenwood I had about 2.5 hr fuel left. I had been flying for about 2 hr.

I believe I got myself into this situation by not getting a proper weather briefing prior to departure – since Tulsa was reported clear I mistakenly assumed that I could fly VFR on top with no problem.

It was a matter of poor judgment on my part in not finding out about a cold front moving through the area and leaving too early before I could properly interpret the weather. I did not call flight service for weather prior to takeoff since the FBO was not open yet. Never again!

Reports 16-18 deal with equipment problems in multi-engine transport aircraft. While the minimum equipment lists (MEL) for such aircraft are carefully designed, they may be misunderstood (16); problems may arise due to other failures in flight (17); or a minor problem may nonetheless significantly increase flight crew workload (18).

16. Submitted by dispatcher:

Flight 123 called into company inbound to BOS Logan Airport. The Captain requested maintenance to dip both tanks. Duty dispatcher called load control company OPS, and advised them to have the captain call dispatch on the ground Boston. The captain called at approximately 1305 hours. I asked him problem of and with the aircraft. He advised fuel gauges gave improper readings. He needed tanks dipped. I informed him maintenance had to repair aircraft as MEL only allowed one fuel quantity indicator to be inoperative. Maintenance was informed repair initiated and flight delayed 25 min for fix.

The inbound flight was operated with both gauges inoperative due to the captain misunderstanding MEL list of aircraft and took aircraft with the squawks.

17. Submitted by pilot:

I accepted a twin engine jet at 0715 E. and planned to operate the aircraft over four route segments on this date. I was informed on arrival that No. 2CSD had been disconnected due to high RISE and OUT temperatures on the previous flight. Before departing, I spoke with the previous captain who said he had been persuaded by maintenance to operate the No. 2 ENG GEN CSD⁴ in spite of the occasional low oil pressure warning he had received. He finally had to disconnect the CSD, however, when the RISE and OUT temperatures exceeded limitations.

My flights were planned at 25,000 ft or below all day – the limiting altitude for operating the APU and thus providing continuous use of two generators. The weather was forecast VFR all the way and scheduled in daylight hours. From ABC to DEF all systems operated normally.

On flight from DEF to GHI during climb to 25,000 ft, we experienced very light icing in a thin cirrus layer starting at about 21,000 ft. At about 23,000 ft the APU generator dropped off the line and almost immediately the No. 1 engine generator also dropped off, leaving us in standby power

⁴No. 2 engine generator constant speed drive

only. APU generator was placed back on bus but fluctuations were noted in EGT (50-75°) and frequency (10-20 cps). Next, No. 1 generator was placed back on the bus and operated O.K.

In 2-3 min, APU generator dropped off again and could not be restored immediately, apparently due to low frequency. At this point we began reducing electrical loads down to about 65 A and requested a lower altitude which would get us below all clouds. We were cleared to 21,000 and then 17,000 and during descent the low pressure light for No. 1 generator CSD came on and the generator dropped off the line. At this point the OUT and RISE temperatures were normal. We restarted the APU and again placed the generator on the line, but soon it dropped off as EGT and frequency again fluctuated widely. We then placed No. 1 generator back on the bus as temperatures were normal and the light had gone out. Within 5 min, however, the light again came on and this time OUT and RISE temperatures were observed to approach the red line — generator was disconnected at this point.

We were again on standby power only and were unable at this altitude to restart the APU, possibly due to having no fuel boost pumps operating. Weather from here to GHI was CAVU and we requested vectors until on approach control and then made a visual approach to the airport. The APU was restarted below 10,000 ft and was placed on the bus on final approach, operating normally on approach, and supported both buses on taxiing.

I felt that if we had not been able to restore the APU generator that conditions for landing were excellent. Wind was down the runway at 15 knots, airplane was light at 80,000 lb; 7500 ft of dry runway was available. We would have been without reversing and anti-skid if the APU had not restarted.

In spite of good weather conditions, the loss of all three generators did cause some disconcerting problems. First, the outflow valve apparently shut fully and caused momentary pressures up to 3000 f.p.m. down. It then required one crew member's full attention to stabilize cabin altitude for the balance of the flight on Manual D.C. Secondly, minor problems with ATC included momentary loss of radio contact, loss of transponder and DME, and the need for vectors. Cooperation by Atlanta and Washington Centers was excellent at all times.

A third, more important problem was with the flight controls. We operated on standby power for perhaps 40 min and during that time were without electrical stabilizer trim, yaw damper, and rudder trim. Most difficult was the rudder out of trim condition which required very heavy rudder inputs during approach until APU generator was placed on the bus. These had evidently been a significant change in trim requirements from the time power was lost at 17,000 ft until we were in the approach. I was also concerned about battery life since we operated for 40 min without charging.

To prevent this situation recurring, I suggest great caution in depending on APU power above 10,000 ft, especially when any ice may be encountered. Secondly, I feel an inspection of the other generator CSD oil level is a must prior to dispatch — the reason for the failure of No. 1 CSD is unknown to me — we did not check oil level upon arrival. The aircraft battery also should be carefully checked before departure.

Finally, I thoroughly agree that dispatch weather should be ideal-DAY VFR, but perhaps should be more restrictive as to altitude or number of segments operating in this condition.

18. Submitted by pilot:

Recently I had a gyro compass problem in a four engine heavy jet. The airplane had sat overnight in sub-freezing temperatures. When we turned on all the electrical systems, the captain's directional gyro initially aligned itself more than 100° off and was correcting slowly. There is no manual alignment feature on the compass card for this airplane. Weather was not a factor so we elected to go with only the first officer's compass card reading correctly.

Even though we knew what the problem was, we were amazed at the confusion this caused once we got into the ATC environment. The RMI's are cross-coupled and it was a real effort to sort out the correct relative bearings of the VORs.

True, this is a problem we brought on ourselves. However, the pressure to get a plane load of passengers to their destination (our trip had already been delayed over an hour) is a powerful inducement to "go" when the discrepancy is considered minor. It was another hour before the compass found the correct alignment.

The suggestion is to put a manual alignment on all gyrosyn compasses.

Reports 19-23 illustrate human factors problems in aircraft of a variety of types, all involve multiple crew members. Report 24 discusses an interesting legal and procedural problem with respect to international operations.

19. Submitted by pilot:

The aircraft was operating as a non-stop from Los Angeles to Atlanta. The trip left Los Angeles at 2200 PST and arrived Atlanta at 0433 EST. The weather from Los Angeles to Atlanta was cloudless with unrestricted visibilities for the entire distance.

Cruise to Atlanta was at 37,000 ft. Approaching Atlanta, the center gave us a clearance to the ATL VOR to cross Dallas International at 12,000 ft. The descent had been started on a previous clearance. A couple of minutes later the clearance was modified to "direct Rex VOR to cross the 30 DME arc of ATL VOR at 12,000 ft maintain 12,000 ft."

The descent seemed to be going well — balanced against time, distance, and rate of descent — and the ground speed indicated a very strong tailwind. The center called at what we thought was near the 30 DME of ATL and wanted to know what our distance was to the ATL VOR and our altitude. It was at this point that it was discovered that both of our VOR receivers were tuned to the REX VOR and that neither pilot was covering the ATL VOR to get the 30 mile fix. As a consequence we wound up over the 30 mile fix of ATL 3000 ft higher than cleared. We admitted this to the center at which time they cleared us to ATL approach control and they worked us in routinely.

The probable cause of this occurrence was lack of coordination on the part of the pilots in setting up proper VOR frequencies in order to obtain the right fix and not advising the other which

frequency he was on. Because of this we wound up over the 30 mile fix of REX which is about 10 miles inside of the 30 mile fix off ATL.

Secondary cause may relate to the time of day, a long non-stop flight, flown entirely on auto-pilot under absolutely ideal weather conditions, an almost total lack of any other traffic, and only the radio contacts as were required to go from one center to another. There was no other traffic in the ATL area when we arrived. Under these conditions one can be lulled into a greatly reduced attention span as a result of boredom, and detail tends to suffer somewhat. The center might have been helpful had they questioned us sooner as to our distance and altitude if they had the capability. This certainly would have alerted us to the fact that all was not well and we could have remedied the situation so that it would have worked out properly. From the pilots point of view it certainly points out the need for them to keep each other posted on how their frequencies are set and to double check them.

Handling the physiological and psychological effects of flying long legs in the wee hours of the morning, with little outside activity to keep you alert, is a problem that seems to have little solution.

20. Submitted by pilot:

On the ground at PDX the F.O. called for ATC clearance to SEA; clearance was "as filed – maintain 9000 – expect flight level 200 3 min after departure"; departure frequency and transponder code was also given. I missed the first portion of the clearance and picked it up as FL200 (the center stored ALT) and got the frequency and transponder code. I set 20,000 in the altitude alert unit and set the transponder code as the F.O. read back the clearance. Again I did not hear the 9000 restriction and asked if we were cleared as filed – the F.O. answered yes. I thought I understood the entire clearance.

The F.O. made the take-off and I changed to departure control and reported leaving 1000 ft and climbing to FL200. The controller said "roger" and gave us additional climb instructions which included a heading change at 2500 ft. At about 8000 ft the F.O. asked if we had been cleared to 20,000 and I replied, yes – at 10,000 ft the controller asked what altitude we had been cleared to and again I replied 20,000. He said we should have been stopped at 9000 then cleared us to FL200 and asked us to expedite through 11,000 which we did.

The F.O. later said we had been cleared to 9000 originally, but thought we had been recleared to FL200 and he had missed the reclearance.

The crew composition helped create this situation as the F.O. regularly flew this trip, the captain was a management pilot who hadn't flown the route recently and the S/O was a reserve who was totally unfamiliar with the route.

The F/O on taxi-in at PDX, unknown to the captain had set 9000 ft in altitude alert system in anticipation of what he knew was a normal altitude restriction for departure, when the captain thought he was given FL200 with the clearance he set in that altitude replacing the 9000 ft. This was missed also by the F.O. as he read back the clearance and was not rechecked for a proper setting prior to takeoff. The captain checked in with departure control after takeoff and stated he

was climbing to FL200 and received no correction when the F.O. asked if we had been cleared to 20,000 ft and got a positive answer he assumed he had missed something and continued to climb through 9000 ft.

I will attempt to prevent a recurrence of this type situation by discussing the entire clearance with the crew and requesting altitude verification when I change controllers during climb and descent. I will also discourage the presetting of instruments until after the clearance has been received and reviewed, and I will encourage the other crew members to be more inquisitive when basic altitudes or route changes occur.

21. Submitted by crewmember:

Crew unintentionally took off without T.O. clearance, misunderstood ground control. While taxiing down runway ground control delivered clearance, crew held check list, crew read back clearance, crew misunderstood ground to say "clearance correct, cleared for T.O.," crew resumed check list from holding point, briefed in position, and took off. Crew requested "going to departure on climb." Ground control advised flight had not been cleared for T.O., crew apologized, ground control advised no problem.

Factors: (1) misunderstanding; (2) no other traffic, no other radio conversations lack of "cues"; (3) habit patterns (being on runway, no other traffic) interrupted check list lead to misunderstanding; (4) ground did not advise flight to contact tower frequency – when ready (this would have been an additional cue to the crew); (5) this tower is not in operation 24 hr a day, so T.O. and landings are not controlled 100 percent of our operations; and (6) on occasion have been cleared for T.O. by ground control and cleared to ramp by tower. Unfortunately, this positively reinforces crews "misunderstanding" during the incidents, although they are unaware of it.

This incident points to the fact that in any "slow" or routine situation we have to be even more alert to potential problems. Many times particularly in very repetitive scheduled type operations, we rely too heavily on established habit patterns.

22. Submitted by pilot.

Cleared to taxi to 27-R for takeoff. Upon arrival at departure end of runway, I noticed a DC-3 waiting for takeoff from same runway. Our aircraft was under control of ground controller. He stated "XZY, use the stub taxiway to get to the runway – the DC-3 will probably be a while running up." This was interpreted to be clearance to take position for takeoff. Frequently, at smaller airports, tower and ground operations are conducted by the same person, on one radio frequency. After entering runway, we were advised to clear runway by tower due to traffic on final for 27R. We assumed that the advice of ground control to use the stub taxiway was clearance onto the runway. We cleared safely while the landing traffic was well out on final. This could have been a serious incident – even though we usually checked the area for traffic, we did not see the aircraft on final approach.

23. Submitted by pilot:

During captain's P/A talk to passengers we received a change of headings and change of altitude from 9000 ft to 14,000? 16,000? Captain started climb and changed power while talking. When I finished talking F/O said left to 160°. I turned aircraft and kept climbing — 16,000 was in altitude reminder window. Leveled off at 16,000 ft. Called departure and requested higher, was advised we should be on center control — called center — he asked if this was our first call. Said yes. He asked for altitude, said 16,000. He said we should be at 14,000 but climb to FL230. We did! We don't know who put 16,000 ft in window of altitude reminder. We could not recall any conversation about changing to center. Number 1 radio still on dept/ctl No. 2 on tower at ATL. Man on dept ctl did not seem to recognize us when we talked to him.

Personal cockpit procedures now incorporate a definite change of control when the man currently flying makes a P/A announcement — hope to avoid future misunderstandings.

24. Submitted by pilot:

It is commonplace that RVR transmissometers will sample a pocket of good visibility and extrapolate it to a misleadingly acceptable minimum. Here was a reverse twist.

Reported weather: 900, scattered, with higher overcast; 2 miles visibility, with blowing snow, and an RVR of 2600 for runway 24L, ILS. U.S. Air Carrier minimum: RVR 5000—1 mile.

Doubting the transmissometer's sampling, its absence of slant-line information, etc., we would normally assume the weather to be as bad or worse than its readout. Since we had at least 3 miles visibility through the vector on downwind, base leg, and long final approach, with the entire field and runways always in plain sight, we assumed the restriction to visibility must be treacherously localized.

We asked the tower for repeated readouts, to catch the trend, and the answer was that the RVR had "been on 2600 all morning (!?) except a couple of times when it jumped to 4500, then back to 2600." He volunteered that the parallel runway's reciprocal RVR (i.e., 06L, closed for maintenance) "was never less than 6000 all morning."

Could the visibility restriction be non-existent? With dark runways to reveal any snow condition we became even more curious and skeptical of such a static readout — especially in an alleged state of variability called "blowing snow."

Before reaching the outer marker the tower asked us if we had the runway in sight, and when we said it was in sight all the time, he cleared us to land on 24L.

The flight behind us asked for the visibility and when given "2," said he would land.

We suspected the RVR value on 24L was either stuck or somehow failing and something about the tower's tone or phrasing reinforced this impression.

With the full 9600 ft of runway exposed before us and monitoring the ILS we executed a normal VFR approach to touch down in a visibility of several miles with no local restriction at any altitude. Our suspicion was confirmed when the tower said that snow sometimes stuck to the transmissometer's glass, giving a lower (false) reading than actual.

This might explain why the 24L pickup facing into the wind was stuck on an incorrect (low) readout, while the one facing downwind on 06L was reporting a sample of the real world. But legally, because we were a U.S. carrier, this could be called a violation of landing minima — although not one by the Canadian carrier behind us.

A few of the possible alternatives:

- Seek a holding pattern and study the “book” for a legal loophole, always with the risk of a real weather change downward;
- Land on the one remaining runway with no RVR, regardless of wind and weather, but “legal” visibility-wise;
- Wait till something might cause the faulty readout to improve;
- Wait for closed runway to open; request it, etc.
- Proceed to alternate, etc.

Were the situation to recur, I'd probably resort to one of these, rather than to merely practical judgment, and this because of the legal restrictions (often contradictory) under which we operate. It does, however, raise old questions about the acceptability limits of fallible machines.

In this case we don't point any finger at the tower. In fact, we sympathize with their own attempts to stay accurate, moral and, above all, “legal.” I appreciate, too, that tower-altitude visibility and visibility within a yard of the ground may be “good” while a stratum of obscuration (smoke, advection fog, etc.) can hang at cockpit eye level, making the transmissometer's word the most truthful.

Nevertheless, it would have helped a lot to know — in flight — that this RVR could be in a downward error. But how could the tower say this without subsequent readouts always being subject to doubt? To be sure, we never trust the extrapolation anyway.

Is there any way the tower could have suggested the RVR's questionability since the readout was obviously “hung up” in a supposedly changing condition, i.e., blowing snow? This being a new scheduled operation for us, perhaps we must yet learn to “read between the lines” what the tower is saying, as we do at so many airports in the U.S.

Still, that doesn't make us legal to approach and land.

Now, then, what to suggest?

I looked up the crew that landed behind us, and the captain's suggestion may be all-round most practical: "When conditions are that good and there is something conspicuously wrong with the transmissometer, they should turn it off."

Or clean it off.

Or get a more accurate up-to-date airport weather sequence whose visibility and restrictions-to-visibility don't require complementary RVR.

(Submitted as an example of a line safety exercise involving legalities, brought about by the mechanical limitation of a measuring device and its failure.)

An aircraft accident some years ago was formally adjudged to be due to "an act of God." It is certainly true that coincidental events can, without advance warning, come together to cause severe problems at a particular focus in the aviation system. One of the best reports of such a problem was submitted by a controller and is quoted here by permission.

25. Submitted by controller:

Two corporate jets passed with less than 1 mile lateral separation at 39,000 ft. XXBG was southbound from east of GSW direct ACT, and YYMP was northwestbound from over CLL direct ACT. ZZMD, a jet also at FL390 was northwestbound from Houston direct SPS and overflying and was well north of the other two aircraft but on the same frequency. A jet tanker and two flights of two fighters were refueling eastbound at 240 thru 270 and communicating on UHF frequencies. All aircraft just mentioned were involved either directly or indirectly and I will refer to them later.

I was working the high manual sector and another controller was working high radar position. I had returned from a relief break approximately 3 min before the incident occurred. When I returned, the other controller was working both manual and radar positions and traffic workload was moderate to heavy. I did not get a briefing due to traffic volume. The radar controller was working the refueling mission with no flight progress strips. The previous controller in more than 30 min of available time had failed to amend the flight progress strips on the tanker so that strips would be printed. Also the other high controller failed to enter any flight plans at all for any one of the four fighters. He had agreed to keep the refueling mission until the flight plans had been taken care of but instead, transferred them to our high sector frequency after clearing them eastbound into the high sector. At the request of the radar controller, I was attempting to gather enough information from the previous controller to straighten out all the flight plans, make necessary computer entries, and coordinate control transfer to the receiving sectors. When I sat down, one flight was breaking off from the tanker. As the Keller, Texas radar was out of service through planned maintenance shutdown, the radar controller cleared two fighters to the Acton VOR to hold. The aircraft advised that he could not hold at all and declared minimum fuel and requested to descend below positive control airspace and return to Carswell VFR. This was coordinated with the low altitude sectors and approved. Before the clearance was issued, the second flight requested breakoff and the tanker also requested a route change. At the same time ZZMD requested altitude change from 390 to 430. The radar man had been tied up with the refuelers and several other climbing and descending aircraft and issued a clearance to ZZMD to expedite climb to 430. He

noticed the two aircraft converging on Waco at 390 and thought that he had climbed YYMP to 430 instead of ZZMD. Approximately 45 sec later he issued traffic to YYMP and asked for his report leaving 410. YYMP reply was blocked by the refuelers and the refuelers were advised to standby. At about this time he lost the radar targets on YYMP and XXBG. A transmission came through from an unidentified source "was that for Mike Delta or Mike Papa?" The radar man replied "that was for YYMP." A transmission from what was later identified as YYMP was blocked by another transmission from one of the refuelers. The refuelers were asked again to stand by and the radar controller asked YYMP to repeat. YYMP then replied that he was level at 390 and inquired if the traffic that had just passed in front of him was at 390. ZZMD also volunteered within a few seconds that he had left 417 for 430. The radar controller advised YYMP that the traffic that passed in front of him (XXBG) was in fact at 390. The controller then realized what had happened. YYMP then informed him that the other aircraft had passed directly in front of and less than 1 mile from him. We did not determine whether evasive action was taken.

I believe the major cause of this incident was the misidentification of two aircraft (YYMP and ZZMD) by the Dallas high radar controller; there are, however, a number of factors that, in my opinion, contributed greatly to the incident.

1. My failure to properly familiarize myself with the sector and obtain a proper briefing prior to assuming the responsibility for the position. Had I done so, I might have been able to spot the potential conflict at FL390 in sufficient time to prevent the incident. At the time, however, I felt that the radar controller needed immediate help and could not have taken the time to give me a proper briefing.

2. Flow control procedures to compensate for the Keller radar outage were inadequate. No restrictions were issued to reduce the volume of traffic or to insure non-radar separation between the affected facilities and sectors. It was the responsibility of the controllers to coordinate on an individual basis if a problem of radar coverage existed. This increased controller coordination workload, which was already heavy due to working a normal volume of traffic in a reduced radar environment. If, for some reason, appropriate flow control restrictions could not be issued, then approval for the shutdown of the Keller radar should not have been given during peak traffic hours.

3. Staffing — At this and many other facilities, no provision is made for additional controllers for relief purposes. The only way a controller can get relief from the sector is by combining sectors or positions of operations. The problem with shuffling controllers to busy positions is that when several sectors are busy at the same time, there are no controllers to shuffle. The staffing problem is not a temporary one. It will continue to be a critical factor for quite some time.

4. The other high controller failed to keep the tanker flight under his control until all flight plan information had been processed, even though he had previously agreed to do so. This contributed greatly to our high radar controller's workload because he had to determine the flight's intentions and attempt to process the flight plans properly with no information other than that displayed on the radar data block and the information gained over the radio. It proved to be an unwarranted distraction at a critical period of time.

5. The military aircraft repeatedly made transmissions of UHF even after being told several times to stand by. Their transmissions blocked several critical replies from YYMP on VHF.

6. Although I do not feel that this is technically a contributing factor, I feel it is important to note that the conflict alert feature of the radar did not trigger between XXBG and YYMP because one of the tracks was in "coast" track. I feel that there may be a false sense of security generated by the conflict alert modification . . . The program will have to be greatly refined before it is of real value. . . .

I have several suggestions on preventing a recurrence of this incident.

1. The major cause and contributing causes (1) and (4) were due to human error. I feel education is the key here. Controllers should be required to spend one or two days quarterly reviewing system errors that may have relevance to their operation. Also, controllers should have more input in eliminating factors that may contribute to a system error.

2. Contributing factors (2), (3), and (6) are primarily the FAA's responsibility. Although official system error reports seldom contain any item that points a finger at management, there is no doubt that these problems do exist. We should make an honest and thorough self-examination of our policies toward flow control, staffing and equipment inadequacies which contribute greatly to system errors.

3. Item (5) above is mainly a pilot misunderstanding of his own responsibility in the safe operation of the ATC system. Perhaps a wide dissemination of reports to the users where pilot action contributes to a system error will help pilots recognize their obligations to the system.

Finally, a series of reports illustrates why pilots get gray (26-28), why controllers get gray (29-31), and why nearly everyone in the system gets gray (32,33). Effective teamwork between flight crew and controllers is evidenced in the vast majority of reports submitted to ASRS, but occasionally it breaks down. These reports are presented in the hope that they will assist each group in understanding better the problems of the other.

26. Submitted by pilot:

On climb out contacted MEM CNTR for VFR flight following — gave position and altitude, type aircraft, and destination. Reported level 7500 ft MSL. At 19:20 CST MEM called target at 2 o'clock, 20 miles south of Paron intersection a twinjet level at 7000. Three to four minutes later, another radar advisory with new traffic at 3 o'clock N.E. heading indicating level 7000 plus previous traffic now level 9000. Reported visual contact with both Three o'clock traffic became no factor, but jet was on an intercept course. Became apparent that the jet was not level 9000, but lower — perhaps descending. Had continuous visual contact and passed above (200 to 300 ft) and 500 ft behind the jet. Had to turn 30°/40° to avoid. No radio contact with MEM Center before (other than the two advisories plus original callup and identification) jet apparently not on same frequency. Two to three minutes later MEM CNTR terminated VFR flight following (no handoff). We called up next sector established radar contact for VFR flight following. Some 13 to 14 min later CNTR asked how close — told him too close — no further comment.

27. Submitted by pilot:

I received a note from my airline stating that they were advised that a flight I had flown did not fly the stored flight plan to CMH. This stored flight plan is via Moper intersection, J-30 to Whett intersection thence J-64 FWA J-178, V279 CMH. It is alleged that we flew J-30 to APE.

I feel that if there was a discrepancy with our flight path and what they think we should be flying that they bring it to our attention immediately so as to minimize any possible problems or hazards.

I also feel it is incumbent on both the pilot and ATC to query the other immediately when there is a question of deviation from an IFR clearance so as to minimize any possible conflict of air traffic.

Also to the best of my recollection I believe I was cleared direct APE by Chicago Center somewhere prior to FWA.

28. Submitted by pilot:

After reaching the number one spot for departure on 35R, a flight behind us was asked if he could get past us. When we asked the tower about this we were told there was a departure on 35L going our same route. Naturally this seemed a bit unusual but of course we accepted it. Eventually we were cleared for takeoff. After passing 100 knots and approaching VI Tower said "Airline 123, abort your takeoff!" With a full load of passengers, even two jump seat riders, many thoughts cross your mind as to what emergency must have occurred to suddenly require the controller to order us to abort our takeoff. Parts falling from the aircraft? A sabotage threat caught in the nick of time?? In any event we came grinding to a halt on a highspeed taxiway. Still no word from the tower. When I asked I was told there was another departure on runway 35L going the same route. It was a clear afternoon with other aircraft having been told to maintain visual separation from departures on the other runway. Without editorializing, I must admit this is a reason that never would have occurred to me as to why an air carrier jet would be ordered to abort a takeoff.

29. Submitted by controller:

On December 10, 1976 at 1441Z, Airline 123 called Clarksburg Tower requesting IFR to Washington National Airport. Due to IFR traffic at 5000 ft MSL enroute from Morgantown, West Virginia to Charleston, West Virginia Airline 123 was issued a clearance which read "Airline 123 cleared to the Washington National Airport. Cross the Elkins 015 radial at or below 4000, maintain 9000, squawk 5761, approach frequency 119.6."

After departure, the local controller observed Airline 123 in his climb proceeding toward the VOR and advised the Approach Controller that Airline 123 appeared higher than 4000 ft MSL.

At this time, the Approach Controller told the aircraft to say altitude. He replied 4500. The Approach Controller told the aircraft maintain 4000 and reinstated the departure restriction. At the same time, the crossing aircraft reported over the VOR and stated that he had the traffic in sight.

The other captain later advised that when he sighted Airline 123, he altered his course to the right to avoid a collision.

I believe that the pilot deviation was caused by either the pilot misunderstanding the departure restriction or because he did not hear the restriction at all. The clearance was delivered to the pilot while the aircraft was taxiing down the active runway for departure. After the clearance was read, the takeoff clearance was given along with traffic information. The aircraft made a 180° turn at the departure end of the runway, the pilot stated "OK, here we come," and the aircraft began its takeoff roll. There was no readback of the clearance.

30. Submitted by controller:

A corporate jet departed White Plains. On initial contact with LGA departure the jet was cleared to 9000 ft and advised on NWbound traffic for which he was being restricted. As he merged with the NWbound traffic (an airline jet vacating 11,000 climbing to 14,000 on the Sloat departure from LGA), I observed that the corporate jet indicated an altitude readout of 099 (9900 ft). When questioned, the corporate jet denied being above 9000, at which time the readout descended to 9400 ft. The aircraft was climbed to 14,000 and advised this would be its final until SBJ.

After the aircraft was changed to a center frequency, the tag indicated 15,000 ft. Center was questioned and stated the aircraft had not been cleared above 14,000 and was arguing with the controller that HPN had issued an incorrect altimeter setting and that he did not want to descend.

While it is well understood that an uninterrupted climb is more economical than a ladder climb, it seems a poor economy to permit system conflicts because of pilot reluctance to comply with ATC clearance to save a few pounds of fuel.

31. Submitted by controller:

A single engine light transport called Kennedy TCA off Islip Airport and requested ATC clearance through the TCA via ISP direct JFK VOR direct COL VOR. The TCA is group one and requires altitude reporting transponder – aircraft did not have one but as controllers were not too busy they issued clearance as requested, to maintain 2500 ft. Pilot acknowledged clearance and proceeded where he wanted to. Controller asked "What's up?" and pilot stated he had lost both VOR's. As aircraft was now down to having only one required item for a TCA clearance (an airplane) TCA clearance was revoked with a 180° turn and reason broadcast. Pilot exited TCA and kicks VOR equipment and called controller again and he had got one VOR operating again and could he have that TCA clearance again. Clearance was issued "present position direct JFK direct COL, maintain 2500." Pilot said thanks (direct heading should have been about 250°) and aircraft took off on about a 330 heading terrorizing four IFR departures off LGA.

Again controller asked pilot "What's happening." Pilot replied "Say again." Pilot was instructed to again make a 180° turn and clear the TCA. Pilot asked why. Explanation was provided and pilot made nasty remark about the FAA being against him and general aviation. Controller told pilot to leave the frequency. . . .

32. Submitted by pilot:

During descent from 10,000 ft, MSL to 2500 MSL TRACON issued VFR traffic at 11 o'clock 3 to 4 miles at 1800 ft MSL southbound. At this time we were at an altitude of above 4000 ft MSL and in the clouds on instrument references of which the controller was advised. Approximately 1 min later we broke out below the cloud deck and visually saw the traffic at 11 o'clock approximately 100 ft below our altitude and less than 300 yards horizontally climbing through our altitude, from left to right. At this time I asked the controller if he had the light jet at our 12 o'clock position. He replied that this was the previously issued traffic. I was somewhat shocked at the observance of this traffic although no evasive action was necessary since at that time evasive action would have been too late, had we been at the same altitude. After the near miss I observed the traffic continuing to climb to my right, at about my 3 o'clock position I observed the traffic penetrating the cloud deck. I asked the controller if the traffic was VFR. He stated that it was and that he had an altitude read out of 4700 ft MSL which was well above the base of the cloud layer. At this time I suggested to the controller that this traffic be followed via radar enabling the ATC facilities to identify the aircraft. . . .

33. Submitted by controller:

Weather estimated 500 broken, 1600 overcast, 1 mile in light snow, wind 140 at 7. Braking action good by car.

A regular scheduled airline flight was cleared for takeoff runway 23L. He departed runway 28R from the intersection leaving him only 4700 ft of usable runway. The local controller decided against alerting the aircraft because local realized that the aircraft had gained too much speed when the situation was first noticed. Although braking was good on 23L, we had no aircraft reports for 28R. The aircraft rotated clearing the far end of the runway. Local controller advised him he had departed 28R instead of 23L and the aircraft replied "Uh uh." He was then instructed to contact departure. We had been operating runway 23 all evening.